WATER POLLUTION CONTROL RESEARCH SERIES 11024DOC08/71

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Storm Water Management Model

Volume IV—Program Listing

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ENVIRONMENTAL PROTECTION AGENCY • WATER QUALITY OFFICE

STORM WATER MANAGEMENT MODEL

Volume IV Program Listing

by

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for the

ENVIRONMENTAL PROTECTION AGENCY

Contract No. 14-12-501 Project No. 11024EBI
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The Water Pollution Control Research Reports describe the results and progress in the control and abatement of pollution of our Nation's waters. They provide a central source of information on the research, development and demonstration activities of the Water Quality Office of the Environmental Protection Agency, through in-house research and grants and contracts with the Federal, State and local agencies, research institutions, and industrial organizations.

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To be continued on inside back cover...

EPA REVIEW NOTICE

This report has been reviewed by the Environmental Protection Agency and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Environmental Protection Agency, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

ABSTRACT

A comprehensive mathematical model, capable of representing urban storm water runoff, has been developed to assist administrators and engineers in the planning, evaluation, and management of overflow abatement alternatives.

Hydrographs and pollutographs (time varying quality concentrations or mass values) were generated for real storm events and systems from points of origin in real time sequence to points of disposal (including travel in receiving waters) with user options for intermediate storage and/or treatment facilities. Both combined and separate sewerage systems may be evaluated. Internal cost routines and receiving water quality output assisted in direct cost-benefit analysis of alternate programs of water quality enhancement.

Demonstration and verification runs on selected catchments, varying in size from 180 to 5,400 acres, in four U.S. cities (approximately 20 storm events, total) were used to test and debug the model. The amount of pollutants released varied significantly with the real time occurrence, runoff intensity duration, pre-storm history, land use, and maintenance. Storage-treatment combinations offered best cost-effectiveness ratios.

A user's manual and complete program listing were prepared.

This report was submitted in fulfillment of Projects 11024 EBI, DOC, and EBJ under Contracts 14-12-501, 502, and 503 under the sponsorship of the Environmental Protection Agency.

The titles and identifying numbers of the final report volumes are:

Title	EPA Report No.
STORM WATER MANAGEMENT MODEL Volume I - Final Report	11024 DOC 07/71
STORM WATER MANAGEMENT MODEL Volume II - Verification and Testing	11024 DOC 08/71
STORM WATER MANAGEMENT MODEL Volume III - User's Manual	11024 DOC 09/71
STORM WATER MANAGEMENT MODEL Volume IV - Program Listing	11024 DOC 10/71

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4	Storage Block	125
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TYPICAL JCL

```
*************************************************************************************

      THIS IS TYPICAL JCL FOR EXECUTING A RUN USING THE COMPLETE MODEL
      (JCL VARIATIONS MAY OCCUR ACCORDING TO MACHINE OR INSTALLATION)

                                  **********

   ((THE FOLLOWING ARE THE ASSUMED TAPE/DISK ASSIGNMENTS FOR EACH BLOCK))

                          INPUT    OUTPUT
            BLOCK         FILE     FILE
            -----         -----    ------

           RUNOFF           0        8
        TRANSPORT           8        9
          STORAGE           9       10
        RECEIVING          10       11
            GRAPH           9        0

                                  **********

//STORM EXEC FORTHCLG,PARM.FORT=MAP
//FORT.SYSIN DD*

     ****** FORTRAN PROGRAM INSERTED HERE ******

/*
//GO.FT08F001 DD DSNAME=C802.RUNOFF,UNIT=2314,DISP=(NEW,KEEP,DELETE),
//              SPACE=(TRK,(10,2),RLSE)
//GO.FT09F001 DD DSNAME=C802.TRANSPORT,UNIT=2314,DISP=(NEW,KEEP,DELETE),
//              SPACE=(TRK,(10,2),RLSE)
//GO.FT10F001 DD DSNAME=C802.STORAGE,UNIT=2314,DISP=(NEW,KEEP,DELETE),
//              SPACE=(TRK,(10,2),RLSE)
//GO.FT11F001 DD DSNAME=C802.RECEIVING,UNIT=2314,DISP=(NEW,KEEP,DELETE),
//              SPACE=(TRK,(10,2),RLSE)
//GO.FT01F001 DD UNIT=2314,DISP=NEW,SPACE=(TRK,(10,2),RLSE),
//              DCB=(RECFM=VS,LRECL=796,BLKSIZE=800)
//GO.FT02F001 DD UNIT=2314,DISP=NEW,SPACE=(TRK,(10,2),RLSE),DCB=*.FT01F001
//GO.FT03F001 DD UNIT=2314,DISP=NEW,SPACE=(TRK,(10,2),RLSE),DCB=*.FT01F001
//GO.FT13F001 DD UNIT=2314,DISP=NEW,SPACE=(TRK,(10,2),RLSE),DCB=*.FT01F001
//GO.SYSYSIN DD*

     ***** DATA CARDS INSERTED HERE *****

/*

*************************************************************************************
```

Section 1

EXECUTIVE BLOCK

	Page
Main Program	5
Subroutine GRAPH	7
Subroutine CURVE	9
Subroutine PINE	11
Subroutine PPLOT	12

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```
C
C                                        STORMWATER MAIN PROGRAM
      DIMENSION PNAME (6,2),TITLE1(10),STORM(4),RAIN(4)
      COMMON /TAPES/ INCNT,IOUTCT,JIN(10),JOUT(10),NSCRAT(5)
      COMMON CNAME(2)
      DATA PNAME / 4HWATE, 4HTRAN, 4HRECE, 4HENDP
     1 , 4HSTOR, 4HGRAP, 4HRSHE, 4HSPOR, 4HIVIN, 4HROGR
     2 , 4HAGE , 4HH
      N5=5
      N6=6
      INCNT=0
      IOUTCT=0
      READ(05,399)TITLE1
  399 FORMAT(10A4)
      READ(05,400)NSERYS,ACRES,ADDWF,NDESYR,DESFLO,NSTRMS,QTRUNK
  400 FORMAT(I5,F10.1,F10.2,I5,F10.1,I5,F10.1)
      WRITE(06,401)NSERYS,TITLE1,ACRES,ADDWF,NDESYR,DESFLO,QTRUNK
  401 FORMAT('1'/////26X,'FEDERAL WATER QUALITY ADMINISTRATION',
     *10X,'CONTRACTS 14-12-501'/26X,'STORMWATER MANAGEMENT PROJECT',
     *27X,'14-12-502',/82X,'14-12-503'///26X,'METCALF & EDDY, INC'//
     *26X,'WATER RESOURCES ENGINEERS, INC'//26X,'UNIVERSITY OF' ,
     *' FLORIDA'////31X,'DEMONSTRATION SERIES NO.',I3/'0',30X,
     *10A4/31X,'COMBINED SEWER AREA OF',F8.2,'ACRES'/31X,'AVERAGE DAILY
     *DRY WEATHER FLOW =',F8.2,'CFS'/31X,I2,'-YEAR DESIGN FLOW =',F10.2,
     *'CFS'/31X,'AVAILABLE MAX. TRUNK CAPACITY =',F10.2,'CFS'//31X,'STOR
     *MS STUDIED:              TOTAL RAINFALL, INCHES')
      DO 500 J=1,NSTRMS
      READ(05,402)STORM,RAIN
  402 FORMAT(4A4,4A4)
      WRITE(06,403)STORM,RAIN
  403 FORMAT(30X,4A4,16X,4A4)
  500 CONTINUE
      WRITE(06,106)
      READ(N5,100) (JIN(J),JOUT(J),J=1,10)
      WRITE(N6,108) JIN,JOUT
      READ(N5,100) (NSCRAT(I),I=1,5)
      WRITE(N6,108) (NSCRAT(I),I=1,5)
  220 CONTINUE
      READ(N5,102) CNAME
      WRITE(N6,106) CNAME
      DO 240 I = 1,6
      IF(CNAME(1).NE.PNAME(I,1).OR.CNAME(2).NE.PNAME(I,2)) GO TO 240
      GO TO (260,280,300,340,360,380),I
  240 CONTINUE
      WRITE(N6,110) CNAME
      STOP 1000
  260 CALL RUNOFF
      GO TO 220
  280 CALL TRANS
      GO TO 220
  300 CALL RECEIV
      GO TO 220
  340 WRITE(N6,104)
      STOP
  360 CALL STORAG
      GO TO 220
  380 CONTINUE
      CALL GRAPH(1)
      GO TO 220
  100 FORMAT(20I4)
```

```
102 FORMAT(2CA4)                                                    MAIN 60
104 FORMAT('1   STORMWATER SIMULATION ENDED')                       MAIN 61
106 FORMAT(1H1,2A4)                                                 MAIN 62
108 FORMAT('0  TAPE ASSIGNMENTS'/(10I10))                           MAIN 63
110 FORMAT('0  CORRECT CNAME NOT FOUND - - ',2A4)                   MAIN 63T
    END                                                             MAIN 64
```

```
      SUBROUTINE GRAPH(IC)                                                  GRAP  1
      COMMON /TAPES/ INCNT,IOUTCT,JIN(10),JOUT(10),NSCRAT(5)                GRAP  2
      COMMON DUMMY(50)                                                      GRAP  3
      COMMON X(201,5),Y(201,5),NLOC(100),YT(160,150),NPT(100)               GRAP  4X
     1,ITAB(101),IPLOT(200)                                                 GRAP  5
      COMMON/LAB/ TITL(18),XLAB(11),YLAB(6),HORIZ(20),VERT(7,6),IT          GRAP  6X
      IF(IC-1) 205,210,210                                                  GRAP  7
  205 READ(5,100) NPLOT,NPCV,NQP                                            GRAP  8
      IF(NPLOT.EQ.0) RETURN                                                 GRAP  9
      NLP=NQP+1                                                             GRAP 10
      READ(5,100) (IPLOT(M),M=1,NPLOT)                                      GRAP 11
      WRITE(6,106) NPLOT,(IPLOT(N),N=1,NPLOT)                               GRAP 12
  106 FORMAT(  'HYDROGRAPHS WILL BE PLOTTED FOR THE FOLLOWING',I5,          GRAP 13
     1' POINTS'/(10I11))                                                    GRAP 14
      IF(NPCV.LT.1) NPCV=1                                                  GRAP 15
      NTAPE=JOUT(IOUTCT)                                                    GRAP 16
      GO TO 220                                                             GRAP 17
  210 CONTINUE                                                              GRAP 18
      READ(5,100) NTAPE,NPCV,NQP,NPLOT                                      GRAP 19
      NLP=NQP+1                                                             GRAP 20
      IF(NPCV.EQ.0) NPCV=5                                                  GRAP 21
      WRITE(6,102) NTAPE,NPCV                                               GRAP 22
      IF(NPLOT.LT.1) GO TO 212                                              GRAP 23
      READ(5,100)(IPLOT(N),N=1,NPLOT)                                       GRAP 24
      WRITE(6,106) NPLOT,(IPLOT(N),N=1,NPLOT)                               GRAP 25
  212 CONTINUE                                                              GRAP 26
  100 FORMAT(16I5)                                                          GRAP 27
  102 FORMAT('1      OUTPUT WILL BE PLOTTED FOR TAPE',I5,'  IN BLOCKS OF   GRAP 28
     1',I5)                                                                 GRAP 29
      READ(5,104) TITL                                                      GRAP 30
      READ(5,104) HORIZ                                                     GRAP 31
      DO 1   JJJ=1,NLP                                                      GRAP 31A
      READ(5,104) (VERT(II,JJJ),II=1,7)                                     GRAP 32X
    1 CONTINUE                                                              GRAP 32A
  220 CONTINUE                                                              GRAP 33
      REWIND NTAPE                                                          GRAP 34
      READ(NTAPE) TITL                                                      GRAP 35
      READ(NTAPE) NSTEPS,NCURVE,NQUAL,TDELT,TZERO,TAREA                     GRAP 35X
      WRITE(6,7091) NSTEPS,NCURVE,NQUAL,TDELT,TZERO,TAREA                   GRAP 37X
 7091 FORMAT(3I10,3F10.1)                                                   GRAP 38X
      NVAL=NCURVE*(NQUAL+1)                                                 GRAP 39
      IF(NVAL.LE.150) GO TO 402                                             GRAP 40X
      WRITE(06,400) NVAL                                                    GRAP 41
  400 FORMAT (' ',' THE GRAPH SUBROUTINE IS ASKING FOR MORE OUTPUT FROM TGRAP 42
     *APE THAN THE DIMENSION OF  YT(160,150) ALLOWS.'/' ',' A VALUE OF ',GRAP 43X
     *I4,' HAS BEEN REQUESTED.  THIS ERROR RESULTED IN A SYSTEM BLOW-UP AGRAP 44
     *T STANFORD ON FORTRAN H, JUNE 1970. DAS'////)                         GRAP 45
      STOP                                                                  GRAP 46
  402 CONTINUE                                                              GRAP 47
      READ(NTAPE) (NLOC(M),M=1,NCURVE)                                      GRAP 48
      WRITE(6,7090) (NLOC(M),M=1,NCURVE)                                    GRAP 49
      IF(NPLOT-1) 245,225,225                                               GRAP 50
  225 K=1                                                                   GRAP 51
      DO 240 M=1,NPLOT                                                      GRAP 52
      DO 230 J=1,NCURVE                                                     GRAP 53
      IF(IPLOT(M)-NLOC(J)) 230,235,230                                      GRAP 54
  230 CONTINUE                                                              GRAP 55
  235 ITAB(K)=J                                                             GRAP 56
      K=K+1                                                                 GRAP 57
  240 CONTINUE                                                              GRAP 58
```

```
      ITAB(K)=0                                                    GRAP 59
      GO TO 260                                                    GRAP 60
  245 DO 250 J=1,NCURVE                                            GRAP 61
  250 ITAB(J)=J                                                    GRAP 62
      ITAB(NCURVE+1)=0                                             GRAP 63
  260 CONTINUE                                                     GRAP 64
      MC=NSTEPS/100                                                GRAP 65
      IF(MC*100.NE.NSTEPS) MC=MC+1                                 GRAP 66
      N=1                                                          GRAP 67
      NR=0                                                         GRAP 68
      DO 300 K=1,NSTEPS,MC                                         GRAP 69
      N=N+1                                                        GRAP 70
      DO 290 J=1,MC                                                GRAP 71
      NR=NR+1                                                      GRAP 72
      IF(NR.GT.NSTEPS) GO TO 290                                   GRAP 73
      READ(NTAPE) TIMES,(YT(N,M),M=1,NVAL)                         GRAP 74
  290 CONTINUE                                                     GRAP 75
      DO 295 M=1,5                                                 GRAP 76
      X(N,M)=TIMES/3600.                                           GRAP 77
  295 CONTINUE                                                     GRAP 78
  300 CONTINUE                                                     GRAP 79
      DO 350 J=1,NLP                                               GRAP 80
      IT=J                                                         GRAP 80A
      K=1                                                          GRAP 81
      L=ITAB(1)                                                    GRAP 82
      DO 320 M=1,NCURVE,NPCV                                       GRAP 83
      IF(L.EQ.0) GO TO 330                                         GRAP 84
      DO 310 MM=1,NPCV                                             GRAP 85
      IF(J-1) 301,301,302                                          GRAP 86
  301 LX=L                                                         GRAP 87
      GO TO 303                                                    GRAP 88
  302 LX=NCURVE+(L-1)*NCUAL+J-1                                    GRAP 89
  303 NPT(MM)=N                                                    GRAP 90
      X(1,MM)=TZERO /3600.                                         GRAP 91
      Y(1,MM)=0.                                                   GRAP 92
      DO 305 NN=2,N                                                GRAP 93
  305 Y(NN,MM)=YT(NN,LX)                                           GRAP 94
      K=K+1                                                        GRAP 95
      L=ITAB(K)                                                    GRAP 96
      IF(L) 315,315,310                                            GRAP 97
  310 CONTINUE                                                     GRAP 98
      NCV=NPCV                                                     GRAP 99
      GO TO 318                                                    GRAP100
  315 NCV=MM                                                       GRAP101
  318 CONTINUE                                                     GRAP102
      ILAB=ITAB(K-1)                                               GRAP103
      CALL CURVE(X,Y,NPT,NCV,NLOC(ILAB))                           GRAP104
  320 CONTINUE                                                     GRAP105
  330 CONTINUE                                                     GRAP106
  350 CONTINUE                                                     GRAP107
  104 FORMAT(20A4)                                                 GRAP108
 7090 FORMAT(10I10)                                                GRAP109
      RETURN                                                       GRAP110
      END                                                          GRAP111
```

```
      SUBROUTINE CURVE (X,Y,NPT,NCV,NPLOT)                              CURV  1
      DIMENSION X(201,10),Y(201,10),NPT(10)                             CURV  2
      COMMON/LAB/ TITLE(18),XLAB(11),YLAB(6)                            CURV  3
     1,HORIZ(20),VERT(7,6),IT                                           CURV  4X
      XMAX=X(1,1)                                                       CURV  5
      XMIN=XMAX                                                         CURV  6
      YMIN=Y(1,1)                                                       CURV  7
      YMAX=YMIN                                                         CURV  8
      DO 205 L=1,NCV                                                    CURV  9
      NPTM=NPT(L)                                                       CURV 10
      IF(NPTM.EQ.0) GO TO 205                                           CURV 11
      DO 204 N=1,NPTM                                                   CURV 12
      IF(X(N,L).LT.XMIN) XMIN=X(N,L)                                    CURV 13
      IF(X(N,L).GT.XMAX) XMAX=X(N,L)                                    CURV 14
      IF(Y(N,L).LT.YMIN) YMIN=Y(N,L)                                    CURV 15
      IF(Y(N,L).GT.YMAX) YMAX=Y(N,L)                                    CURV 16
  204 CONTINUE                                                          CURV 17
  205 CONTINUE                                                          CURV 18
      RANGE=(YMAX-YMIN)/5.                                              CURV 19
      IF(RANGE.GT.0.) GO TO 2059                                        CURV 20
      IF(YMAX.GT.0.) YMIN=0.                                            CURV 21
      IF(YMAX.LT.0.) YMAX=0.                                            CURV 22
      RANGE=(YMAX-YMIN)/5.                                              CURV 23
 2059 CONTINUE                                                          CURV 24
      A=ALOG10(RANGE)                                                   CURV 25
      IF(A.LT.0.) GO TO 220                                             CURV 26
      N=A                                                               CURV 27
      RANGE=RANGE/(10.**N)                                              CURV 28
      L=RANGE+1.001                                                     CURV 29
  206 CONTINUE                                                          CURV 30
      IF(L.EQ.2) GO TO 209                                              CURV 31
      IF(L.GT.4) GO TO 207                                              CURV 32
      L=4                                                               CURV 33
  207 IF(L.GT.5) L=10                                                   CURV 34
  209 CONTINUE                                                          CURV 35
      FRANG=L*10.**N                                                    CURV 36
      GO TO 240                                                         CURV 37
  220 M=A-0.5999                                                        CURV 38
      N=-M                                                              CURV 39
      RANGE=RANGE*10.**N                                                CURV 40
      L=RANGE+1.001                                                     CURV 41
  226 CONTINUE                                                          CURV 42
      IF(L.EQ.2) GO TO 229                                              CURV 43
      IF(L.GT.4) GO TO 227                                              CURV 44
      L=4                                                               CURV 45
  227 CONTINUE                                                          CURV 46
      IF(L.GT.5) L=10                                                   CURV 47
  229 CONTINUE                                                          CURV 48
      FRANG=L/10.**N                                                    CURV 49
  240 CONTINUE                                                          CURV 50
      K=YMIN/FRANG                                                      CURV 51
      IF(YMIN.LT.0.) K=K-1                                              CURV 52
      IF(YMAX.LE.(K+5)*FRANG) GO TO 250                                 CURV 53
      L=L+1                                                             CURV 54
      IF(L.LT.11) GO TO 245                                             CURV 55
      L=2                                                               CURV 56
      N=N+1                                                             CURV 57
      IF(A.LE.0.) N=N-2                                                 CURV 58
  245 CONTINUE                                                          CURV 59
      IF(A) 226,206,206                                                 CURV 60
```

```
250 YMIN=K*FRANG                                                    CURV 61
    YMAX=(K+5)*FRANG                                                CURV 62
    XSCAL=100./(XMAX-XMIN)                                          CURV 63
    YSCAL=50./(YMAX-YMIN)                                           CURV 64
    XINT=(XMAX-XMIN)/10.                                            CURV 65
    YINT=(YMAX-YMIN)/5.                                             CURV 66
    XLAB(1) =XMIN                                                   CURV 67
    DO 260 N=1,10                                                   CURV 68
    XLAB(N+1)=XLAB(N)+XINT                                          CURV 69
260 CONTINUE                                                        CURV 70
    YLAB(6)=YMIN                                                    CURV 71
    DO 270 N=1,5                                                    CURV 72
270 YLAB(6-N)=YLAB(7-N)+YINT                                        CURV 73
    CALL PPLOT(0.0,100,NPLOT)                                       CURV 74
    K = 1                                                           CURV 75
    DO 450 L=1,NCV                                                  CURV 76
     IF(NPT(L).EQ.0) GO TO 440                                      CURV 77
    XO=XSCAL*(X(1,L)-XMIN)                                          CURV 78
    YO=YSCAL*(Y(1,L)-YMIN)                                          CURV 79
    NPOINT = NPT(L)                                                 CURV 80
    DO 400 N = 2,NPOINT                                             CURV 81
    XT = XSCAL*(X(N,L) - XMIN)                                      CURV 82
    YT = YSCAL*(Y(N,L) - YMIN)                                      CURV 83
    CALL PLINE(XO,YO,XT,YT,K,NPLOT)                                 CURV 84
    XO = XT                                                         CURV 85
    YO = YT                                                         CURV 86
400 CONTINUE                                                        CURV 87
420 CONTINUE                                                        CURV 88
440 K = K + 1                                                       CURV 89
450 CONTINUE                                                        CURV 90
    CALL PPLOT(0,0,99,NPLOT)                                        CURV 91
    RETURN                                                          CURV 92
    END                                                             CURV 93
```

```
      SUBROUTINE PINE(X1,Y1,X2,Y2,NSYM,NCT)                          PINE   1
      AXA=X1                                                         PINE   2
      AXB=X2                                                         PINE   3
      AYA=Y1                                                         PINE   4
      AYB=Y2                                                         PINE   5
      N=1                                                            PINE   6
      IF(ABS(AXB-AXA).LT.ABS(AYB-AYA)) GO TO 290                     PINE   7
C                                                                    PINE   8
C     SET PARAMETERS FOR X DIRECTION                                 PINE   9
C                                                                    PINE  10
      IF(AXB-AXA) 241,400,245                                        PINE  11
  241 CONTINUE                                                       PINE  12
      AXA=X2                                                         PINE  13
      AXB=X1                                                         PINE  14
      AYA=Y2                                                         PINE  15
      AYB=Y1                                                         PINE  16
  245 CONTINUE                                                       PINE  17
      IXA=AXA+.5                                                     PINE  18
      IXB=AXB+.5                                                     PINE  19
      IYA=AYA+.5                                                     PINE  20
      IYB=AYB+.5                                                     PINE  21
  250 CONTINUE                                                       PINE  22
      IF(IXA.LT.C.OR.IXA.GT.100) GO TO 260                           PINE  23
      IF(IYA.LT.C.OR.IYA.GT.50) GO TO 260                            PINE  24
      CALL PPLOT(IXA,IYA,NSYM,NCT)                                   PINE  25
  260 CONTINUE                                                       PINE  26
      IXA=IXA+1                                                      PINE  27
      YA=(N*(AYB-AYA))/(AXB-AXA)                                     PINE  28
      IYA=AYA+YA+0.5                                                 PINE  29
      N=N+1                                                          PINE  30
      IF(IXA.LE.IXB) GO TO 250                                       PINE  31
      GO TO 400                                                      PINE  32
C                                                                    PINE  33
C     SET PARAMETERS FOR Y DIRECTION                                 PINE  34
C                                                                    PINE  35
  290 CONTINUE                                                       PINE  36
      IF(AYB.GT.AYA)   GO TO 295                                     PINE  37
      AYB=Y1                                                         PINE  38
      AYA=Y2                                                         PINE  39
      AXB=X1                                                         PINE  40
      AXA=X2                                                         PINE  41
  295 CONTINUE                                                       PINE  42
      IXA=AXA+.5                                                     PINE  43
      IXB=AXB+.5                                                     PINE  44
      IYA=AYA+.5                                                     PINE  45
      IYB=AYB+.5                                                     PINE  46
  300 CONTINUE                                                       PINE  47
      IF(IXA.LT.0.OR.IXA.GT.100) GO TO 310                           PINE  48
      IF(IYA.LT.C.OR.IYA.GT.50) GO TO 310                            PINE  49
      CALL PPLOT(IXA,IYA,NSYM,NCT)                                   PINE  50
  310 CONTINUE                                                       PINE  51
      IYA=IYA+1                                                      PINE  52
      XA=(N*(AXB-AXA))/(AYB-AYA)                                     PINE  53
      IXA=XA+AXA+0.5                                                 PINE  54
      N=N+1                                                          PINE  55
      IF(IYA-IYB) 300,320,400                                        PINE  56
  320 IXA = IXB                                                      PINE  57
      GO TO 300                                                      PINE  58
  400 RETURN                                                         PINE  59
      END                                                            PINE  60
```

```
      SUBROUTINE PPLOT(IX,IY,K,NCT)                                     PPLO  1
      DIMENSION A(51,101),SYM(9)                                        PPLO  2
      COMMON /LAB/ TITLE(18),XLAB(11),YLAB(6)                           PPLO  3
     1,HORIZ(20),VERT(7,6),IT                                           PPLO  4X
      DATA SYM / 4H****,4H++++, 4H''''', 4HXXXX, 4H....., 4H2222,       PPLO  5
     1 4H    , 4HIIII, 4H---- /                                         PPLO  6
      IF(K-99) 200,220,230                                              PPLO  7
  200 A(51-IY,IX+1)=SYM(K)                                              PPLO  8
      RETURN                                                            PPLO  9
  220 CONTINUE                                                          PPLO 10
      I=0                                                               PPLO 11
      WRITE(6,103) TITLE,NCT                                            PPLO 12
      DO 225 II=1,6                                                     PPLO 13
      I=I+1                                                             PPLO 14
      IF(YLAB(1).LE.100000.)WRITE(6,101)YLAB(II),(A(I,J),J=1,101)       PPLO 15
      IF(YLAB(1).GT.100000.)WRITE(6,107)YLAB(II),(A(I,J),J=1,101)       PPLO 16
      IF(II.EQ.6) GO TO 228                                             PPLO 17
      DO 224 JJ=1,9                                                     PPLO 18
      I=I+1                                                             PPLO 19
      IF(I.NE.28) GO TO 221                                             PPLO 20
      WRITE(6,108) VERT(5,IT),VERT(6,IT),VERT(7,IT),(A(I,J),J=1,101)    PPLO 21X
      GO TO 224                                                         PPLO 22
  221 IF(I.NE.24) GO TO 222                                             PPLO 23
      WRITE(6,106) VERT(1,IT),VERT(2,IT),(A(I,J),J=1,101)               PPLO 24X
      GO TO 224                                                         PPLO 25
  222 IF(I.NE.26) GO TO 223                                             PPLO 26
      WRITE(6,106) VERT(3,IT),VERT(4,IT),(A(I,J),J=1,101)               PPLO 27X
      GO TO 224                                                         PPLO 28
  223 WRITE(6,100) (A(I,J),J=1,101)                                     PPLO 29
  224 CONTINUE                                                          PPLO 30
  225 CONTINUE                                                          PPLO 31
  228 CONTINUE                                                          PPLO 32
      WRITE(6,102) XLAB                                                 PPLO 33
      WRITE(6,105) HORIZ                                                PPLO 34
  100 FORMAT(1H ,101A1)                                                 PPLO 35
  101 FORMAT(' ',F16.3,1X,101A1)                                        PPLO 36
  102 FORMAT(' ',F19.1,10F10.1)                                         PPLO 37
  103 FORMAT(1H1,20X,18A4,16/)                                          PPLO 38
  105 FORMAT(/30X,20A4)                                                 PPLO 39
  106 FORMAT(3X,2A4,7X,101A1)                                           PPLO 40
  107 FORMAT(' ',1PE16.2,1X,101A1)                                      PPLO 41
  108 FORMAT(3X,3A4,3X,101A1)                                           PPLO 41A
  230 DO 250 I=1,50                                                     PPLO 42
      DO 240 J=1,101                                                    PPLO 43
  240 A(I,J)=SYM(7)                                                     PPLO 44
      A(I,1)=SYM(8)                                                     PPLO 45
  250 CONTINUE                                                          PPLO 46
      DO 260 J=1,101                                                    PPLO 47
  260 A(51,J)=SYM(9)                                                    PPLO 48
      DO 270  I=1,101,10                                                PPLO 49
  270 A(51,I)=SYM(8)                                                    PPLO 50
      DO 290 I=11,41,10                                                 PPLO 51
      A(I,1)=SYM(9)                                                     PPLO 52
  290 CONTINUE                                                          PPLO 53
      RETURN                                                            PPLO 54
      END                                                               PPLO 55
```

Section 2

RUNNOFF BLOCK

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```
      SUBROUTINE RUNOFF                                                  RUNO  1
      COMMON /TAPES/ INCNT,IOUTCT,JIN(10),JOUT(10),NSCRAT(5)             RUNO  2
C                                                                        RUNO  3
      WRITE(6,102)                                                       RUNO  4
  102 FORMAT('1     ENTRY MADE TO RUNOFF MODEL')                         RUNO  5
      INCNT=INCNT+1                                                      RUNO  6
      IOUTCT=IOUTCT+1                                                    RUNO  7
      CALL HYDRO                                                         RUNO  8
      CALL GRAPH(0)                                                      RUNO  9
      CALL SFCLAL                                                        RUNO 10
      RETURN                                                             RUNO 11
      END                                                                RUNO 12
```

```
      SUBROUTINE GUTTER                                                 GUTT  1
C                                                                       GUTT  2
C     THIS SUBROUTINE COMPUTES THE INSTANTANEOUS WATER DEPTH            GUTT  3
C          AND FLOW RATE FOR THE GUTTERS/PIPES                          GUTT  4
C                                                                       GUTT  5
C***************** SPECIFICATION STATEMENTS                            GUTT  6
C                                                                       GUTT  7
      COMMON /TAPES/ INCNT,IOUTCT,JIN(10),JOUT(10),NSCRAT(5)            GUTT  8
      COMMON NW,NG,NIN,HISTOG,TRAIN,DELT,DELT2,NOW,NOG,NSTEP,TAREA,     GUTT  9
     1 TIME,TIME2,RI,RLOSS,SUMR,SUMI,SUMOFF,SUMST,TZERO,NING            GUTT 10
      COMMON WFLOW(160),WWIDTH(160),WAREA(160),WSLOPE(160),WN(160),     GUTT 11
     1 WSTORE(160,3),WLMAX (160),WLMIN(160),DECAY(160),WDEPTH(160,3),   GUTT 12
     2 WCON(160,3),NAMEW(160),PCIMP(160)                                GUTT 13
      COMMON GFLOW(160),GWIDTH(160),GLEN(160),GSLOPE(160),GS1(160),     GUTT 14
     1 GS2(160),GN(160),GDEPTH(160),GCON(160),NPG(160),DFULL(160),      GUTT 15
     2 NGUT(160),SUMQW(160),PCTZER                                      GUTT 16
      COMMON NWTOG(160,10),NGTOG(160,10),NWTOI(10),NGTOI(160)           GUTT 17
      COMMON RAIN(160,10),NHYET(160),NRAIN,NPGAG,NHISTO,THISTO          GUTT 18
      COMMON CSUR(160),DELD(160),QIN(160)                               GUTT 19
      COMMON IPRNT(160),ISAVE(160),NPRNT,NSAVE,OUTFLW(160),INTERV,      GUTT 20
     1 INTCNT                                                           GUTT 21
      NOUT=JOUT(IOUTCT)                                                 GUTT 22
      NTQUAL=NSCRAT(1)                                                  GUTT 23
C                                                                       GUTT 24
      DO 400 N=1,NOG                                                    GUTT 25
      J=NGUT(N)                                                         GUTT 26
C                                                                       GUTT 27
C******** INPUTS FROM ADJACENT WATERSHED AREAS                         GUTT 28
C                                                                       GUTT 29
      SUMQW(J)=0.                                                       GUTT 30
      DO 220 JK=1,NIN                                                   GUTT 31
      IF(NWTOG(J,JK).EQ.0) GO TO 240                                    GUTT 32
      NX=NWTOG(J,JK)                                                    GUTT 33
  220 SUMQW(J)=SUMQW(J)+WFLOW(NX)                                       GUTT 34
C                                                                       GUTT 35
C******** INPUTS FROM UPSTREAM GUTTERS                                 GUTT 36
C                                                                       GUTT 37
  240 QIN(J)=SUMQW(J)                                                   GUTT 38
      DO 260 JK=1,NIN                                                   GUTT 39
      IF(NGTOG(J,JK).EQ.0) GO TO 280                                    GUTT 40
      NX=NGTOG(J,JK)                                                    GUTT 41
  260 QIN(J)=QIN(J)+GFLOW(NX)                                           GUTT 42
C                                                                       GUTT 43
  280 DO=GDEPTH(J)                                                      GUTT 44
      IF(QIN(J).NE.0.) GO TO 290                                        GUTT 45
      IF(GDEPTH(J).EQ.0.) GO TO 391                                     GUTT 46
  290 IF(NPG(J).EQ.3) GO TO 391                                         GUTT 47
      IFLG=0                                                            GUTT 48
      DELD(J)=0.                                                        GUTT 49
      DO 360 I=1,30                                                     GUTT 50
C                                                                       GUTT 51
C******** COMPUTE CHANGE IN DEPTH (NEWTON-RAPHSON)                     GUTT 52
C                                                                       GUTT 53
C******** ESTIMATED FINAL DEPTH                                        GUTT 54
      D1=GDEPTH(J)+DELD(J)                                              GUTT 55
      IF(NPG(J).EQ.2) GO TO 295                                         GUTT 56
C                                                                       GUTT 57
C                  * * * * * * * * * * * * * * * * * * * * * * *        GUTT 58
C                                                                       GUTT 59
C**** TRAPEZOIDAL GUTTER                                                GUTT 60
```

```
C
      IF(D1.LT.0.) D1=0.                                                        GUTT 61
C                                                                               GUTT 62
C                                                                               GUTT 63
C******** VOLUME CHANGE (TRAPEZOIDAL SECTION)                                   GUTT 64
      DELV=GLEN(J)*DELD(J)*((GS1(J)+GS2(J))*(D0+0.5*DELD(J))+GWIDTH(J))         GUTT 65
      DDELV=GLEN(J)*((GS1(J)+GS2(J))*D1+GWIDTH(J))                              GUTT 66
C                                                                               GUTT 67
C******** CROSS-SECTIONAL AREA (TRAPEZOIDAL CROSS-SECTION)                      GUTT 68
      AX0=0.5*(GS1(J)+GS2(J))*D0**2+GWIDTH(J)*D0                                GUTT 69
      AX1=0.5*(GS1(J)+GS2(J))*D1**2+GWIDTH(J)*D1                                GUTT 70
      DAX1=(GS1(J)+GS2(J))*D1+GWIDTH(J)                                         GUTT 71
C                                                                               GUTT 72
C******** WETTED PERIMETER (TRAPEZOIDAL CROSS-SECTION)                          GUTT 73
      WP0=SQRT(GS1(J)**2+1.)*D0+SQRT(GS2(J)**2+1.)*D0+GWIDTH(J)                 GUTT 74
      WP1=SQRT(GS1(J)**2+1.)*D1+SQRT(GS2(J)**2+1.)*D1+GWIDTH(J)                 GUTT 75
      DWP1=SQRT(GS1(J)**2+1.)+SQRT(GS2(J)**2+1.)                                GUTT 76
      GO TO 315                                                                 GUTT 77
C                                                                               GUTT 78
C                * * * * * * * * * * * * * * * * * * * * * * *                  GUTT 79
C                                                                               GUTT 80
C**** CIRCULAR PIPE                                                             GUTT 81
C                                                                               GUTT 82
  295 IF(I.GT.1) GO TO 307                                                      GUTT 83
      D1=1.57079&3                                                              GUTT 84
      DELD(J)=D1-GDEPTH(J)                                                      GUTT 85
  307 IF(D1.GT.0.) GO TO 308                                                    GUTT 86
      D1=0.                                                                     GUTT 87
      DELD(J)=-GDEPTH(J)                                                        GUTT 88
  308 IF(D1.LE.DFULL(J)) GO TO 310                                              GUTT 89
      D1=DFULL(J)                                                               GUTT 90
      DELD(J)=D1-GDEPTH(J)                                                      GUTT 91
C                                                                               GUTT 92
C******** VOLUME CHANGE (PIPE)                                                  GUTT 93
  310 DELV=GLEN(J)*(GWIDTH(J)**2/4.)*(DELD(J)-0.5*SIN(2.*D1)                    GUTT 94
     1 +0.5*SIN(2.*D0))                                                         GUTT 95
      DDELV=GLEN(J)*(GWIDTH(J)**2/4.)*(1.-COS(2.*D1))                           GUTT 96
C                                                                               GUTT 97
C******** CROSS-SECTIONAL AREA (PIPE)                                           GUTT 98
      AX0=(GWIDTH(J)**2/4.)*(D0-0.5*SIN(2.*D0))                                 GUTT 99
      AX1=(GWIDTH(J)**2/4.)*(D1-0.5*SIN(2.*D1))                                 GUTT100
      DAX1=(GWIDTH(J)**2/4.)*(1.-COS(2.*D1))                                    GUTT101
C                                                                               GUTT102
C******** WETTED PERIMETER (PIPE)                                               GUTT103
      WP0=GWIDTH(J)*D0                                                          GUTT104
      WP1=GWIDTH(J)*D1                                                          GUTT105
      DWP1=GWIDTH(J)                                                            GUTT106
C                                                                               GUTT107
C                * * * * * * * * * * * * * * * * * * * * * * *                  GUTT108
C                                                                               GUTT109
C******** HYDRAULIC RADIUS (ALL CROSS-SECTIONS)                                 GUTT110
  315 IF(AX0.LT.0.) AX0=0.                                                      GUTT111
      IF(AX1.LT.0.) AX1=0.                                                      GUTT112
      IF(WP0.LE.0.) WP0=0.001                                                   GUTT113
      IF(WP1.LE.0.) WP1=0.001                                                   GUTT114
      RAD0=AX0/WP0                                                              GUTT115
      RAD1=AX1/WP1                                                              GUTT116
C                                                                               GUTT117
C******** FLOW                                                                  GUTT118
      FLOW0=GCON(J)*(AX0**1.6666667)/(WP0**0.66666667)                          GUTT119
      FLOW1=GCON(J)*(AX1**1.6666667)/(WP1**0.66666667)                          GUTT120
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      FLOW=0.5*(FLOW0+FLOW1)                                            GUTT121
      DFLOW1=C.5*GCON(J)*(1.6666667*(RAD1**0.66666667)*DAX1             GUTT122
     1 -0.66666667*(RAD1**1.6666667)*DWP1)                              GUTT123
C                                                                       GUTT124
C******** NEWTON-RAPHSON CORRECTION (ALL CROSS-SECTIONS)                GUTT125
      F=DELV+DELT*(FLOW-QIN(J))-QSUR(J)                                 GUTT126
      DF=DDELV+DELT*DFLOW1                                              GUTT127
C                                                                       GUTT128
      IF(DF.GT.0.) GO TO 320                                            GUTT129
C******** ZERO SLOPE                                                    GUTT130
      DEL=0.01                                                          GUTT131
      GO TO 340                                                         GUTT132
C******** NON-ZERO SLOPE                                                GUTT133
  320 DEL=DELD(J)-F/DF                                                  GUTT134
C******** CONVERGENCE CHECK (INDIVIDUAL GUTTER)                         GUTT135
  340 IF(I.EQ.1) GO TO 360                                              GUTT136
      IF(GDEPTH(J)+DEL.LT.DFULL(J)) GO TO 355                           GUTT137
      IF(IFLG.EQ.1) GO TO 390                                           GUTT138
      DEL=DFULL(J)-GDEPTH(J)                                            GUTT139
      IFLG=1                                                            GUTT140
      GO TO 360                                                         GUTT141
  355 IFLG=0                                                            GUTT142
      IF(ABS(F).LT.0.1) GO TO 380                                       GUTT143
  360 DELD(J)=DEL                                                       GUTT144
      WRITE(6,1000) TIME,J,GDEPTH(J),DELD(J)                            GUTT145
 1000 FORMAT(' CHECK RESULTS.  NOT CONVERGED IN *GUTTER*',              GUTT146
     1 F8.0,I6,2E12.5)                                                  GUTT147
C                                                                       GUTT148
C******** NEW DEPTH AT END OF TIME INTERVAL                             GUTT149
C                                                                       GUTT150
  380 DELD(J)=DEL                                                       GUTT151
      GDEPTH(J)=GDEPTH(J)+DELD(J)                                       GUTT152
      QSUR(J)=C.                                                        GUTT153
C                                                                       GUTT154
C******** AVERAGE FLOW DURING TIME INTERVAL                             GUTT155
C                                                                       GUTT156
      GFLOW(J)=FLOW                                                     GUTT157
      GO TO 400                                                         GUTT158
C                                                                       GUTT159
C******* SURCHARGE                                                      GUTT160
C                                                                       GUTT161
  390 GDEPTH(J)=DFULL(J)                                                GUTT162
      GFLOW(J)=FLOW1                                                    GUTT163
      QSUR(J)=QSUR(J)+(QIN(J)-FLOW)*DELT                                GUTT164
      GO TO 400                                                         GUTT165
  391 GFLOW(J)=QIN(J)                                                   GUTT166
  400 CONTINUE                                                          GUTT167
C                                                                       GUTT168
C                                          PRINT SELECTED OUTPUT        GUTT169
C                                                                       GUTT170
      IF(NPRNT.LT.1) GO TO 510                                          GUTT171
      INTCNT=INTCNT+1                                                   GUTT172
      IF(INTCNT.LT.INTERV) GO TO 510                                    GUTT173
      INTCNT=0                                                          GUTT174
      DO 500 N=1,NPRNT                                                  GUTT175
      J=IPRNT(N)                                                        GUTT176
  500 OUTFLW(N)=QIN(J)                                                  GUTT177
      NTIMEH=TIME/3600.                                                 GUTT178
      TIMEM=TIME/60.-FLOAT(NTIMEH)*60.                                  GUTT179
      WRITE(6,9010) NTIMEH,TIMEM,(OUTFLW(N),N=1,NPRNT)                  GUTT180
```

```
 9010 FORMAT(I4,F6.2,10F10.2,/(10X,10F10.2))                              GUTT181
      DO 505 N=1,NOG                                                      GUTT182
      J=NGUT(N)                                                           GUTT183
      IF(QSUR(J).GT.0) WRITE(6,9000) J,QSUR(J),GFLOW(J)                   GUTT184
 9000 FORMAT(' GUTTER',I4,' SURCHARGED, SURCHARGE='F10.0,' CUFT,FLOW='    GUTT185
     1F10.1,' CFS')                                                       GUTT186
  505 CONTINUE                                                            GUTT187
C                                                                         GUTT188
C                                    WRITE INLETS TO BE SAVED             GUTT189
C                                                                         GUTT190
  510 IF(NSAVE.LT.1) GO TO 610                                            GUTT191
      DO 600 N=1,NSAVE                                                    GUTT192
      J=ISAVE(N)                                                          GUTT193
  600 OUTFLW(N)=QIN(J)                                                    GUTT194
      WRITE(NCUT) TIME,(OUTFLW(N),N=1,NSAVE)                              GUTT195
      WRITE(NTCLAL)(OUTFLW(N),N=1,NSAVE)                                  GUTT196
  610 CONTINUE                                                            GUTT197
C                                                                         GUTT198
      RETURN                                                              GUTT199
      END                                                                 GUTT200
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```
      SUBROUTINE HCURVE(NTYPE,INLET)                                    HCUR  1
      COMMON NW,NG,NIN,HISTCG,TRAIN,DELT,DELT2,NOW,NUG,NSTEP,TAREA,     HCUR  2
     1 TIME,TIME2,RI,RLOSS,SUMR,SUMI,SUMOFF,SUMST,TZERO,NING            HCUR  3
      COMMON WFLOW(160),WWIDTH(160),WAREA(160),WSLOPE(160),WN(160),     HCUR  4
     1 WSTORE(160,3),WLMAX (160),WLMIN(160),DECAY(160),WDEPTH(160,3),   HCUR  5
     2 WCON(160,3),NAMEW(160),PCIMP(160)                                HCUR  6
      COMMON GFLOW(160),GWIDTH(160),GLEN(160),GSLOPE(160),GS1(160),     HCUR  7
     1 GS2(160),GN(160),GDEPTH(160),GCON(160),NPG(160),DFULL(160),      HCUR  8
     2 NGUT(160),SUMQW(160),PCTZER                                      HCUR  9
      COMMON NWTOG(160,10),NGTOG(160,10),NWTOI(10),NGTOI(160)           HCUR 10
      COMMON RAIN(160,10),NRYET(160),NRAIN,NRGAG,NHISTO,THISTO          HCUR 11
      COMMON QSUR(160),DELD(160),QIN(160)                               HCUR 12
      COMMON IPRAT(160),ISAVE(160),NPRNT,NSAVE,OUTFLW(160),INTERV,      HCUR 13
     1 INTCNT                                                           HCUR 14
      COMMON CLMMY(40)                                                  HCUR 15
      COMMON HGRAPH(160),HTIME(160)                                     HCUR 16
      COMMON X(201,5),Y(201,5),NPT(5)                                   HCUR 17
      COMMON/LAB/ TITLE(18),XLAB(11),YLAB(6)                            HCUR 18
     1,HORIZ(20),VERT(7,6),IT                                           HCUR 19X
      DIMENSION    VER(7,2),TITL(7,2)                                   HCUR 20X
      DIMENSION TITEL(18),ORIZ(20)                                      HCUR 21
      DATA TITL     /4HRAIN,4HFALL,4H HYE,4HTUGR,4HAPH  ,4H    ,4H    , HCUR 22X
     .               4HINLE,4HT HY,4HDROG,4HRAPH,4H    ,4H     ,4H    / HCUR 23X
      DATA TITEL / 16*4H    ,4HBASI,4HN NO /                            HCUR 24
      DATA ORIZ /8*4H    ,4HTIME,4H IN ,4HHOUR,4HS   ,8*4H    /         HCUR 25
      DATA VER / 4HRAIN,4HFALL,4H   I,4HN   ,4HIN /,4H  HR,4H          HCUR 26X
     1, 4H RUN,4HOFF ,4H   I,4HN   ,4H  CF,4HS   ,4H    /              HCUR 27X
      DO 750 I=1,18                                                     HCUR 28
  750 TITLE(I)=TITEL(I)                                                 HCUR 29
      DO 760 I=1,20                                                     HCUR 30
  760 HORIZ(I)=ORIZ(I)                                                  HCUR 31
C      RAINFALL HYETOGRAPH OR INLET HYDROGRAPH                          HCUR 32
      IT=1                                                              HCUR 32A
      DO 5 I=1,7                                                        HCUR 33X
      J = I+2                                                           HCUR 34
      VERT(I,IT)=VER(I,NTYPE)                                           HCUR 35X
      TITLE(J) = TITL(I,NTYPE)                                          HCUR 36
    5 CONTINUE                                                          HCUR 37
      IF(NTYPE.GT.1) GO TO 380                                          HCUR 38
      NGAGP=5                                                           HCUR 39
      TMAX=FLOAT(NSTEP)*DELT+TZERO                                      HCUR 40
      I=0                                                               HCUR 41
      DO 350 J=1,NRGAG,NGAGP                                            HCUR 42
      DO 300 K=1,NGAGP                                                  HCUR 43
      I=I+1                                                             HCUR 44
      IF(I.GT.NRGAG) GO TO 320                                          HCUR 45
      TIME=TZERO                                                        HCUR 46
      N=0                                                               HCUR 47
      DO 250 L=1,NHISTO                                                 HCUR 48
      N=N+1                                                             HCUR 49
      X(N,K)=TIME/3600.                                                 HCUR 50
      Y(N,K)=RAIN(L,I)*43200.                                           HCUR 51
      TIME=TIME+ HISTOG                                                 HCUR 52
      IF(TIME.GT.TMAX) GO TO 300                                        HCUR 53
      IF(NHISTO.GT.50) GO TO 250                                        HCUR 54
      N=N+1                                                             HCUR 55
      X(N,K)=TIME/3600.                                                 HCUR 56
      Y(N,K)=RAIN(L,I)*43200.                                           HCUR 57
  250 CONTINUE                                                          HCUR 58
      N=N+1                                                             HCUR 59
```

```
      X(N,K)=TMAX/3600.                                                  HCUR 60
      Y(N,K)=C.                                                          HCUR 61
  300 NPT(K)=N                                                           HCUR 62
      K=NGAGP+1                                                          HCUR 63
  320 K=K-1                                                              HCUR 64
      CALL CURVE(X,Y,NPT,K,INLET)                                        HCUR 65
      JT=J+K-1                                                           HCUR 66
      WRITE(6,9000) (K,K=J,JT)                                           HCUR 67
 9000 FORMAT(/30X,'RAINGAGE LEGEND',I8,4H = *,I8,4H = +,I8,4H = ',I8,    HCUR 68
     14H = X,I8,4H = .)                                                  HCUR 69
  350 CONTINUE                                                           HCUR 70
      RETURN                                                             HCUR 71
  380 X(1,1)=HTIME(1)                                                    HCUR 72
      Y(1,1)=HGRAPH(1)                                                   HCUR 73
C     CHOOSE THE SCALE DOWN FACTOR                                       HCUR 74
      M=(NSTEP+99)/100                                                   HCUR 75
      I = 1                                                              HCUR 76
      DO 10 J = M,NSTEP,M                                                HCUR 77
      I = I + 1                                                          HCUR 78
      X(I,1)=HTIME(I)                                                    HCUR 79
      Y(I,1)=HGRAPH(I)                                                   HCUR 80
   10 CONTINUE                                                           HCUR 81
   48 NPT(1)=1                                                           HCUR 82
      CALL CURVE(X,Y,NPT,1,INLET)                                        HCUR 83
      RETURN                                                             HCUR 84
      END                                                                HCUR 85
```

```
      SUBROUTINE HYDRC                                                  HYDR  1
C                                                                       HYDR  2
C******************** SPECIFICATION STATEMENTS                          HYDR  3
C                                                                       HYDR  4
      COMMON NW,NG,NIN,HISTCG,TRAIN,DELT,DELT2,NOW,NOG,NSTEP,TAREA,     HYDR  5
     1 TIME,TIME2,RI,RLOSS,SUMR,SUMI,SUMOFF,SUMST,TZERO,NING            HYDR  6
      COMMON WFLOW(160),WWIDTH(160),WAREA(160),WSLOPE(160),WN(160),     HYDR  7
     1 WSTORE(160,3),WLMAX (160),WLMIN(160),DECAY(160),WDEPTH(160,3),   HYDR  8
     2 WCON(160,3),NAMEW(160),PCTMP(160)                                HYDR  9
      COMMON GFLOW(160),GWIDTH(160),GLEN(160),GSLOPE(160),GS1(160),     HYDR 10
     1 GS2(160),GN(160),GDEPTH(160),GCON(160),NPG(160),DFULL(160),      HYDR 11
     2 NGUT(160),SUMQW(160),PCTZER                                      HYDR 12
      COMMON NWTOG(160,10),NGTOI(160,10),NWTOI(10),NGTOI(160)           HYDR 13
      COMMON RAIN(160,10),NHYET(160),NRAIN,NRGAG,NHISTO,THISTO          HYDR 14
      COMMON QSUR(160),DELD(160),QIN(160)                               HYDR 15
      COMMON IPRNT(160),ISAVE(160),NPRNT,NSAVE,OUTFLW(160),INTERV,      HYDR 16
     1 INTCNT                                                           HYDR 17
      COMMON TITLE(40)                                                  HYDR 18
      COMMON HGRAPH(160),HTIME(160)                                     HYDR 19
C                                                                       HYDR 20
C******** INITIALIZATION                                               HYDR 21
C                                                                       HYDR 22
      NW=160                                                            HYDR 23
      NG=160                                                            HYDR 24
      NING=160                                                          HYDR 25
      NRANVL=200                                                        HYDR 26
      NIN=10                                                            HYDR 27
      INTCNT=0                                                          HYDR 28
      DO 220 I=1,NW                                                     HYDR 29
      WFLOW(I)=0.0                                                      HYDR 30
      WWIDTH(I)=0.                                                      HYDR 31
      WDEPTH(I,1)=0.                                                    HYDR 32
      WDEPTH(I,3)=0.                                                    HYDR 33
  220 WDEPTH(I,2)=0.                                                    HYDR 34
      DO 240 I=1,NG                                                     HYDR 35
      NPG(I)=0                                                          HYDR 36
      NGUT(I)=0.                                                        HYDR 37
      QSUR(I)=0.0                                                       HYDR 38
      DELD(I)=0.0                                                       HYDR 39
      QIN(I)=0.0                                                        HYDR 40
      GFLOW(I)=0.0                                                      HYDR 41
      GDEPTH(I)=0.                                                      HYDR 42
  240 GLEN(I)=0.                                                        HYDR 43
      DO 250 J=1,NING                                                   HYDR 44
  250 NGTOI(J)=0                                                        HYDR 45
      DO 260 J=1,NIN                                                    HYDR 46
      NWTOI(J)=0                                                        HYDR 47
      DO 260 I=1,NG                                                     HYDR 48
      NWTOG(I,J)=0                                                      HYDR 49
  260 NGTOG(I,J)=0                                                      HYDR 50
      DO 280 I=1,NRANVL                                                 HYDR 51
      HGRAPH(I)=0.                                                      HYDR 52
      HTIME(I)=0.                                                       HYDR 53
      DO 280 J=1,10                                                     HYDR 54
  280 RAIN(I,J)=0.                                                      HYDR 55
      SUMR = 0.0                                                        HYDR 56
      SUMI = 0.0                                                        HYDR 57
      SUMOFF = 0.0                                                      HYDR 58
      SUMST = 0.0                                                       HYDR 59
C                                                                       HYDR 60
```

```
C******** CALL INPUT SUBROUTINE                                          HYDR  61
C                                                                       HYDR  62
      CALL RHYDRO(INLET)                                                HYDR  63
      TIME=TZERO                                                        HYDR  64
C                                                                       HYDR  65
C******** SET UP ORDERING ARRAY                                         HYDR  66
      DO 2200 I=1,NING                                                  HYDR  67
      IF(NGTOI(I).EQ.0) GO TO 2220                                      HYDR  68
      NSPOT=NG+1-I                                                      HYDR  69
 2200 NGUT(NSPOT)=NGTOI(I)                                              HYDR  70
C******** BUILD TREE STRUCTURE                                          HYDR  71
 2220 DO 2260 I=1,NG                                                    HYDR  72
      KSPOT=NG+1-I                                                      HYDR  73
      ISUB=NGLT(KSPOT)                                                  HYDR  74
      IF(ISUB.LE.0) GO TO 2260                                          HYDR  75
      DO 2240 J=1,NIN                                                   HYDR  76
      IF(NGTOG(ISUB,J).EQ.0) GO TO 2260                                 HYDR  77
      NSPOT=NSPOT-1                                                     HYDR  78
 2240 NGUT(NSPOT)=NGTOG(ISUB,J)                                         HYDR  79
 2260 CONTINUE                                                          HYDR  80
C******** SHIFT TO START OF ARRAY                                       HYDR  81
      NSPOT=0                                                           HYDR  82
      DO 2280 I=1,NG                                                    HYDR  83
      IF(NGLT(I).EQ.0) GO TO 2280                                       HYDR  84
      NSPOT=NSPOT+1                                                     HYDR  85
      NGUT(NSPOT)=NGUT(I)                                               HYDR  86
 2280 CONTINUE                                                          HYDR  87
C                                                                       HYDR  88
C******** CALCULATE INLET HYDROGRAPH                                    HYDR  89
C                                                                       HYDR  90
      M=(NSTEP+99)/100                                                  HYDR  91
      I=1                                                               HYDR  92
      HTIME(1)=TZERO/3600.                                              HYDR  93
      DO 440 II=1,NSTEP,M                                               HYDR  94
      I=I+1                                                             HYDR  95
      DO 430 IJ=1,M                                                     HYDR  96
      TIME=TIME+DELT                                                    HYDR  97
      TIME2=TIME-DELT2                                                  HYDR  98
      HTIME(I)=TIME/3600.                                               HYDR  99
C                                                                       HYDR100
C******** WATERSHED ELEMENTS (OVERLAND FLOW)                            HYDR101
C                                                                       HYDR102
      CALL WSHED                                                        HYDR103
C                                                                       HYDR104
C******** GUTTER ELEMENTS                                               HYDR105
C                                                                       HYDR106
      IF(NUG.EQ.0) GO TO 340                                            HYDR107
      CALL GUTTER                                                       HYDR108
  340 CONTINUE                                                          HYDR109
C                                                                       HYDR110
C******** HYDROGRAPH CONSTRUCTION                                       HYDR111
C                                                                       HYDR112
C******** WATERSHEDS CONNECTED DIRECTLY TO INLET                        HYDR113
      HGRAPH(I)=0.                                                      HYDR114
      DO 360 JK=1,NIN                                                   HYDR115
      IF(NWTOI(JK).EQ.0) GO TO 380                                      HYDR116
      NX=NWTOI(JK)                                                      HYDR117
  360 HGRAPH(I)=HGRAPH(I)+WFLOW(NX)                                     HYDR118
C                                                                       HYDR119
C******** GUTTERS CONNECTED TO INLET                                    HYDR120
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```
  380 IF(NOG.EC.0) GO TO 420                                                HYDR121
      DO 400 JK=1,NING                                                      HYDR122
      IF(NGTOI(JK).EQ.0) GO TO 420                                          HYDR123
      NX=NGICI(JK)                                                          HYDR124
  400 HGRAPH(I)=HGRAPH(I)+GFLOW(NX)                                         HYDR125
  420 CONTINUE                                                              HYDR126
C******** SUM FOR CONTINUITY CHECK                                         HYDR127
      SUMOFF=SUMOFF+HGRAPH(I)*DELT                                          HYDR128
C                                                                           HYDR129
  430 CONTINUE                                                              HYDR130
  440 CONTINUE                                                              HYDR131
C                                                                           HYDR132
C******** CONTINUITY CHECK                                                  HYDR133
      DO 460 K=1,NOW                                                        HYDR134
      J=NAMEW(K)                                                            HYDR135
      SUMST=SUMST+WDEPTH(J,1)*WAREA(J)*PCIMP(J)/10000.*(100.-PCTZER)        HYDR136
     1+WDEPTH(J,2)*(100.-PCIMP(J))/100.                                     HYDR137
  460 CONTINUE                                                              HYDR138
      ERROR=(SUMR-SUMI-SUMOFF-SUMST)*100./SUMR                              HYDR139
      WRITE(6,9000) SUMR,SUMI,SUMOFF,SUMST,ERROR                            HYDR140
 9000 FORMAT('1TOTAL RAINFALL (CU FT)                          ',F10.0//    HYDR141
     1       ' TOTAL INFILTRATION (CU FT)                      ',F10.0//    HYDR142
     2       ' TOTAL GUTTER FLOW AT INLET (CU FT)              ',F10.0//    HYDR143
     3       ' TOTAL SURFACE STORAGE AT END OF STORM (CU FT)',F10.0//        HYDR144
     4       ' ERROR IN CONTINUITY, PERCENTAGE OF RAINFALL, ',F10.5)        HYDR145
C                                                                           HYDR146
C******** OUTPUT                                                           HYDR147
C                                                                           HYDR148
       CALL HCURVE(1,INLET)                                                 HYDR149
       CALL HCURVE(2,INLET)                                                 HYDR150
      RETURN                                                                HYDR151
      END                                                                   HYDR152
```

```
      SUBROUTINE RHYDRO(INLET)                                                  RHYD   1
      COMMON /TAPES/ INCNT,IOUTCT,JIN(10),JOUT(10),NSCRAT(5)                    RHYD   2
      COMMON NW,NG,NIN,HISTOG,TRAIN,DELT,DELT2,NOW,NOG,NSTEP,TAREA,             RHYD   3
     1 TIME,TIME2,RI,RLOSS,SUMR,SUMI,SUMOFF,SUMST,TZERO,NING                    RHYD   4
      COMMON WFLOW(160),WWIDTH(160),WAREA(160),WSLOPE(160),WN(160),             RHYD   5
     1 WSTORE(160,3),WLMAX (160),WLMIN(160),DECAY(160),WDEPTH(160,3),           RHYD   6
     2 WCON(160,3),NAMEW(160),PCIMP(160)                                        RHYD   7
      COMMON GFLOW(160),GWIDTH(160),GLEN(160),GSLOPE(160),GS1(160),             RHYD   8
     1 GS2(160),GN(160),GDEPTH(160),GCON(160),NPG(160),DFULL(160),              RHYD   9
     2 NGUT(160),SUMQW(160),PCTZER                                              RHYD  10
      COMMON NWTOG(160,10),NGTOG(160,10),NWTOI(10),NGTOI(160)                   RHYD  11
      COMMON RAIN(160,10),NHYET(160),NRAIN,NRGAG,NHISTO,THISTO                  RHYD  12
      COMMON QSUR(160),DELD(160),QIN(160)                                       RHYD  13
      COMMON IPRNT(160),ISAVE(160),NPRNT,NSAVE,OUTFLW(160),INTERV,              RHYD  14
     1 INTCNT                                                                   RHYD  15
     2,TITLE(40)                                                                RHYD  16
C                                                                               RHYD  17
C**** GENERAL INFORMATION                                                       RHYD  18
C                                                                               RHYD  19
      READ(5,1005) TITLE                                                        RHYD  20
 1005 FORMAT(20A4)                                                              RHYD  21
      READ(5,1000) INLET,NSTEP, NHR,NMN,DELT,NRGAG                              RHYD  22
     1,PCTZER                                                                   RHYD  23
 1000 FORMAT(215,I3,I2,F5.1,I5,F5.0)                                            RHYD  24
      IF(PCTZER.EQ.0.)  PCTZER=25.                                              RHYD  25
      TZERO=3600.*FLOAT(NHR)+60.*FLOAT(NMN)                                     RHYD  26
      WRITE(6,1010) TITLE,INLET,NSTEP                                           RHYD  27
 1010 FORMAT(1H ,20A4/,1H ,20A4//                                               RHYD  28
     1, '0INLET NUMBER',I5/'0NUMBER OF  TIME  STEPS',I5)                        RHYD  29
      WRITE(6,1041) DELT                                                        RHYD  30
      WRITE(6,1043) PCTZER                                                      RHYD  31
 1043 FORMAT(1H0,F4.1,' PERCENT OF IMPERVIOUS AREA HAS ZERO DETENTION DE       RHYD  32
     1PTH')                                                                     RHYD  33
C                                                                               RHYD  34
C**** RAINFALL INTENSITY HISTOGRAM                                              RHYD  35
C                                                                               RHYD  36
      READ(5,1020) NHISTO,THISTO                                                RHYD  37
 1020 FORMAT(I5,F5.0)                                                           RHYD  38
      WRITE(6,1040) NHISTO,THISTO                                               RHYD  39
 1040 FORMAT( '0FOR',I6,' RAINFALL STEPS, THE TIME INTERVAL IS'                 RHYD  40
     1,F7.2,' MINUTES')                                                         RHYD  41
      TRAIN=FLOAT(NHISTO)*THISTO+TZERO/60.                                      RHYD  42
      DO 230 N=1,NRGAG                                                          RHYD  43
      READ(5,1030) (RAIN(I,N),I=1,NHISTO)                                       RHYD  44
 1030 FORMAT(10F5.0)                                                            RHYD  45
C                                                                               RHYD  46
C******** PRINT RAINFALL HISTORY                                                RHYD  47
      WRITE(6,1042) N,(RAIN(I,N),I=1,NHISTO)                                    RHYD  48
 1042 FORMAT( '0FOR RAINGAGE NUMBER',I4,'   RAINFALL HISTORY IS'                RHYD  49
     1//(10F10.2))                                                              RHYD  50
 1041 FORMAT('0INTEGRATION TIME INTERVAL (MINUTES),',F8.2)                      RHYD  51
      DO 220 I=1,NHISTO                                                         RHYD  52
  220 RAIN(I,N)=RAIN(I,N)/43200.                                                RHYD  53
  230 CONTINUE                                                                  RHYD  54
      TRAIN = TRAIN*60.                                                         RHYD  55
      HISTOG = THISTO*60.                                                       RHYD  56
      DELT = DELT*60.                                                           RHYD  57
      DELT2 = DELT/2.                                                           RHYD  58
C                                                                               RHYD  59
C**** WATERSHED DATA                                                            RHYD  60
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C                                                                       RHYD 61
      NOW=0                                                             RHYD 62
      NSTOP=0                                                           RHYD 63
      TAREA=0.                                                          RHYD 64
      WRITE(6,1050)                                                     RHYD 65
 1050 FORMAT('1SUBAREA   GUTTER   WIDTH    AREA   PERCENT    SLOPE    RERHYD 66
     1SISTANCE FACTOR  SURFACE STORAGE(IN)    INFILTRATION RATE(IN/HR)  RHYD 67
     1GAGE'/                                                            RHYD 68
     2' NUMBER  OR MANHOLE  (FT)    (AC)   IMPERV.   (FT/FT)    IMPERV. RHYD 69
     3   PERV.    IMPERV.    PERV.   MAXIMUM MINIMUM DECAY RATE   NO')  RHYD 70
      DO 340 I=1,NW                                                     RHYD 71
      READ(5,1060) JK,N,NGOTO,W1,W2,W3,W4,W5,W6,W7,W8                   RHYD 72
     1,W9,W10,W11                                                       RHYD 73
 1060 FORMAT(3I5,3F5.0,7F5.3,F10.5)                                     RHYD 74
      IF(W4.EQ.0.) W4=0.03                                              RHYD 75
      IF(W5.EQ.0.) W5=0.013                                             RHYD 76
      IF(W6.EQ.0.) W6=0.25                                              RHYD 77
      IF(W7.EQ.0.) W7=0.062                                             RHYD 78
      IF(W8.EQ.0.) W8=0.184                                             RHYD 79
      IF(W9.EQ.0.) W9=3.0                                               RHYD 80
      IF(W10.EQ.0.) W10=0.52                                            RHYD 81
      IF(W11.EQ.0.) W11=0.00115                                         RHYD 82
      IF(JK.EQ.0) JK=1                                                  RHYD 83
      IF(N.EQ.0) GO TO 360                                              RHYD 84
      NOW=NOW+1                                                         RHYD 85
      NAMEW(NOW)=N                                                      RHYD 86
C                                                                       RHYD 87
C******** PRINT WATERSHED DATA                                          RHYD 88
      WRITE(6,1070) N,NGOTO,W1,W2,W3,W4,W5,W6,W7,W8                     RHYD 89
     1,W9,W10,W11,JK                                                    RHYD 90
 1070 FORMAT(I5,I9,F11.0,F8.0,F9.1,5F10.3,F9.2,F8.2,F12.5,I5)           RHYD 91
      IF(N.GT.NW) GO TO 320                                             RHYD 92
C                                                                       RHYD 93
C******** TRANSFER DATA AND CONVERT UNITS                               RHYD 94
      NHYET(N)=JK                                                       RHYD 95
      WWIDTH(N)=W1                                                      RHYD 96
      WAREA(N)=W2*43560.                                                RHYD 97
      PCIMP(N)=W3                                                       RHYD 98
      WSLOPE(N)=W4                                                      RHYD 99
      WSTORE(N,1)=W7/12.                                                RHYD100
      WSTORE(N, 2)=W8/12.                                               RHYD101
      WLMAX(N)=W9/43200.                                                RHYD102
      WLMIN(N)=W10/43200.                                               RHYD103
      DECAY(N)=W11                                                      RHYD104
      WCON(N,1)=-(1.486/W5)*SQRT(W4)*W1*100./(WAREA(N)*PCIMP(N))        RHYD105
      WCON(N,2)=-(1.486/W6)*SQRT(W4)*W1*100./(WAREA(N)*(100.-PCIMP(N))) RHYD106
      WSTORE(N,3)=0.                                                    RHYD107
      WCON(N,3)=WCON(N,1)                                               RHYD108
      TAREA=TAREA+W2                                                    RHYD109
C                                                                       RHYD110
C******** SET UP CONNECTIVITY TABLES                                    RHYD111
      IF(NGOTO.EQ.0) GO TO 260                                          RHYD112
C******** GUTTER CONNECTION                                             RHYD113
      DO 240 J=1,NIN                                                    RHYD114
      IF(NWTOG(NGOTO,J).GT.0) GO TO 240                                 RHYD115
      NWTOG(NGOTO,J)=N                                                  RHYD116
      GO TO 340                                                         RHYD117
  240 CONTINUE                                                          RHYD118
C******** DIRECT INLET CONNECTION                                       RHYD119
  260 DO 280 J=1,NIN                                                    RHYD120
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      IF(NWTOI(J).GT.C) GO TC 280                                        RHYD121
      NWTOI(J)=N                                                         RHYD122
      GO TO 340                                                          RHYD123
  280 CONTINUE                                                           RHYD124
C                                                                        RHYD125
C******** ERROR IN DATA                                                  RHYD126
  320 NSTOP=1                                                            RHYD127
      WRITE(6,1090) JK,N,NW                                              RHYD128
 1090 FORMAT('  FOR INLET ',I4,5X,'THE ASSIGNED WATERSHED NO',I10,5X,    RHYD129
     1' IS LARGER THAN THE ALLOWED NO',I10)                              RHYD130
  340 CONTINUE                                                           RHYD131
  360 WRITE(6,1100)NOW,TAREA                                             RHYD132
 1100 FORMAT('0TOTAL NUMBER OF SUBCATCHMENTS,',I4/                       RHYD133
     1 '0TOTAL TRIBUTARY AREA (ACRES),',F8.2)                            RHYD134
C                                                                        RHYD135
C******** GUTTER AND PIPE DATA                                           RHYD136
C                                                                        RHYD137
      NOG=0                                                              RHYD138
      WRITE(6,1110)                                                      RHYD139
 1110 FORMAT('1GUTTER       GUTTER        WIDTH      LENGTH      SLOPE    SIRHYD140
     1DE SLOPES      MANNING     OVERFLOW'/                              RHYD141
     2       ' NUMBER    CONNECTION       (FT)       (FT)      (FT/FT)   RHYD142
     3L     R              N                (IN)'/)                      RHYD143
      DO 480 I=1,NG                                                      RHYD144
      READ(5,1115)JK,N,NGOTC,NP,G1,G2,G3,G4,G5,G6,G7                     RHYD145
 1115 FORMAT(4I5,7F8.0)                                                  RHYD146
      IF(N.EC.C) GO TC 500                                               RHYD147
      NOG=NOG+1                                                          RHYD148
C                                                                        RHYD149
C******** PRINT GUTTER/PIPE DATA                                         RHYD150
      WRITE(6,1120) N,NGOTO,   G1,G2,G3,G4,G5,G6,G7                      RHYD151
 1120 FORMAT(I5,112,F14.1,F10.0,F10.3,F9.1,F6.1,F11.3,F12.2)             RHYD152
      IF(NP.EC.2) WRITE(6,1122)                                          RHYD153
 1122 FORMAT('+     *')                                                 RHYD154
      IF(N.GT.NG) GO TO 440                                              RHYD155
C                                                                        RHYD156
C******** TRANSFER DATA AND CONVERT UNITS                                RHYD157
      NPG(N)=NP                                                          RHYD158
      GWIDTH(N)=G1                                                       RHYD159
      GLEN(N)=G2                                                         RHYD160
      GSLOPE(N)=G3                                                       RHYD161
      GS1(N)=G4                                                          RHYD162
      GS2(N)=G5                                                          RHYD163
      GN(N)=G6                                                           RHYD164
      DFULL(N)=G7                                                        RHYD165
      IF(NP.EC.2) DFULL(N)=2.62                                          RHYD166
      IF(DFULL(N).LE.0.) DFULL(N)=10.                                    RHYD167
      GCON(N)=(1.486/GN(N))*SQRT(GSLOPE(N))                              RHYD168
C                                                                        RHYD169
C******** SET UP CONNECTIVITY TABLES                                     RHYD170
      IF(NGOTC.EC.0) GO TO 400                                           RHYD171
C                                                                        RHYD172
C******** GUTTER CONNECTION                                              RHYD173
      DO 380 J=1,NIN                                                     RHYD174
      IF(NGTCG(NGOTO,J).GT.0) GO TC 380                                  RHYD175
      NGTCG(NGOTC,J)=N                                                   RHYD176
      GO TO 4EC                                                          RHYD177
  380 CONTINUE                                                           RHYD178
C                                                                        RHYD179
C******** INLET CONNECTION                                               RHYD180
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  400 DO 420 J=1,NIN                                                    RHYD181
      IF(NGTOI(J).GT.0) GO TO 420                                       RHYD182
      NGTOI(J)=N                                                        RHYD183
      GO TO 480                                                         RHYD184
  420 CONTINUE                                                          RHYD185
C                                                                       RHYD186
C******** ERROR IN DATA                                                 RHYD187
  440 NSTOP=1                                                           RHYD188
      WRITE(6,1130) JK,N,NG                                             RHYD189
 1130 FORMAT('  FOR INLET',I5,5X,'THE ASSIGNED GUTTER NO',I10,5X,       RHYD190
     1'IS LARGER THAN ALLOWED NO',I10)                                  RHYD191
  480 CONTINUE                                                          RHYD192
  500 WRITE(6,1150) NCG                                                 RHYD193
C                                                                       RHYD194
C                                        CREATE DUMMY GUTTERS AS NEEDED RHYD195
C                                                                       RHYD196
      DO 540 N=1,NG                                                     RHYD197
      IF(NWTOG(N,1).EQ.0.AND.NGTOG(N,1).EQ.0) GO TO 540                 RHYD198
      IF(NPG(N).NE.0) GO TO 540                                         RHYD199
      NPG(N)=3                                                          RHYD200
      NOG=NCC+1                                                         RHYD201
      DO 520 J=1,NING                                                   RHYD202
      IF(NGTOI(J).GT.0) GO TO 520                                       RHYD203
      NGTOI(J)=N                                                        RHYD204
      GO TO 540                                                         RHYD205
  520 CONTINUE                                                          RHYD206
  540 CONTINUE                                                          RHYD207
 1150 FORMAT('0TOTAL NUMBER OF GUTTERS/PIPES,',I4)                      RHYD208
      WRITE(6,1151)                                                     RHYD209
 1151 FORMAT('CASTERISK (*) DENOTES CIRCULAR PIPE, DIAMETER=.WIDTH.')   RHYD210
  600 CONTINUE                                                          RHYD211
C                                                                       RHYD212
C**** PRINT CONNECTIVITY SUMMARY                                        RHYD213
C                                                                       RHYD214
      WRITE(6,1190)                                                     RHYD215
 1190 FORMAT('1ARRANGEMENT OF SUBCATCHMENTS AND GUTTERS/PIPES'//        RHYD216
     1'        GUTTER', 5X,'TRIBUTARY GUTTER/PIPE',40X,                RHYD217
     2'TRIBUTARY SUBAREA')                                              RHYD218
      DO 620 J=1,NG                                                     RHYD219
      IF(GLEN(J).LE.0.) GO TO 620                                       RHYD220
      DO 605 N=1,NIN                                                    RHYD221
      IF(NGTOG(J,N)) 605,606,605                                        RHYD222
  605 CONTINUE                                                          RHYD223
  606 N=N-1                                                             RHYD224
      IF(N) 607,607,608                                                 RHYD225
  607 WRITE(6,1200) J                                                   RHYD226
      GO TO 609                                                         RHYD227
  608 WRITE(6,1200) J,(NGTOG(J,I),I=1,N)                                RHYD228
 1200 FORMAT(/I10,5X,10I5/(10I5))                                       RHYD229
  609 DO 610 N=1,NIN                                                    RHYD230
      IF(NWTOG(J,N)) 610,615,610                                        RHYD231
  610 CONTINUE                                                          RHYD232
  615 N=N-1                                                             RHYD233
      IF(N) 620,620,616                                                 RHYD234
  616 WRITE(6,1230)  (NWTOG(J,I),I=1,N)                                 RHYD235
 1230 FORMAT(1H+,74X,10I5)                                              RHYD236
  620 CONTINUE                                                          RHYD237
      WRITE(6,1240)                                                     RHYD238
 1240 FORMAT('0       INLET',6X,'TRIBUTARY GUTTER-PIPE-MANHOLE',       RHYD239
     132X,'TRIBUTARY SUBAREA')                                          RHYD240
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      DO 628 N=1,NING                                                    RHYD241
      IF(NGTCI(N)) 628,630,628                                           RHYD242
  628 CONTINUE                                                           RHYD243
  630 N=N-1                                                              RHYD244
      IF(N) 634,634,633                                                  RHYD245
  633 WRITE(6,1200) INLET,(NGTOI(I),I=1,N)                               RHYD246
      GO TO 635                                                          RHYD247
  634 WRITE(6,1200) INLET                                                RHYD248
  635 DO 636 N=1,NIN                                                     RHYD249
      IF(NWTCI(N)) 636,638,636                                           RHYD250
  636 CONTINUE                                                           RHYD251
  638 N=N-1                                                              RHYD252
      IF(N) 640,640,639                                                  RHYD253
  639 WRITE(6,1230) (NWTOI(I),I=1,N)                                     RHYD254
  640 CONTINUE                                                           RHYD255
C                                                                        RHYD256
C                                                                        RHYD257
C                                    READ INFORMATION TO CONTROL         RHYD258
C                                    INLETS SAVED AND PRINTED            RHYD259
      NTQUAL=NSCRAT(1)                                                   RHYD260
      REWIND NTQUAL                                                      RHYD261
      READ(5,1205) NSAVE                                                 RHYD262
      IF(NSAVE.LT.1) GO TO 660                                           RHYD263
      READ(5,1205) (ISAVE(N),N=1,NSAVE)                                  RHYD264
 1205 FORMAT(16I5)                                                       RHYD265
      WRITE(6,1210) NSAVE,(ISAVE(N),N=1,NSAVE)                           RHYD266
 1210 FORMAT(  '0HYDROGRAPHS WILL BE  STORED FOR THE FOLLOWING',I5,      RHYD267
     1' POINTS'/(1CI1C))                                                 RHYD268
      NOUT=JCUT(IOUTCT)                                                  RHYD269
      REWIND NCUT                                                        RHYD270
      WRITE(NOUT) TITLE                                                  RHYD271
      NQUAL=0                                                            RHYD272
      WRITE(NCUT) NSTEP,NSAVE,NQUAL,DELT,TZERO,TAREA                     RHYD273X
      WRITE(NOUT) (ISAVE(N),N=1,NSAVE)                                   RHYD274
      WRITE(NTQUAL) NSAVE,(ISAVE(N),N=1,NSAVE)                           RHYD275
  660 CONTINUE                                                           RHYD276
      READ(5,1205) NPRNT,INTERV                                          RHYD277
      IF(NPRNT.LT.1) GO TO 680                                           RHYD278
      READ(5,1205) (IPRNT(N),N=1,NPRNT)                                  RHYD279
      WRITE(6,1220)  NPRNT,(IPRNT(N),N=1,NPRNT)                          RHYD280
 1220 FORMAT(  '1HYDROGRAPHS ARE LISTED FOR THE FOLLOWING',I5,' POINTS'/RHYD281
     1/'      TIME ',1CI10/(10X,10I10))                                   RHYD282
      WRITE(6,1225)                                                      RHYD283
 1225 FORMAT(1H )                                                        RHYD284
  680 CONTINUE                                                           RHYD285
C                                                                        RHYD286
C******** EXIT IF ERROR HAS BEEN DETECTED                                RHYD287
      IF(NSTOP.EQ.1) STOP                                                RHYD288
      RETURN                                                             RHYD289
      END                                                                RHYD290
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      SUBROUTINE WSHED                                                  WSHE  1
C                                                                       WSHE  2
C     THIS SUBROUTINE COMPUTES THE INSTANTANEOUS WATER DEPTH            WSHE  3
C          AND FLOW RATE FOR THE WATERSHED AREAS                        WSHE  4
C                                                                       WSHE  5
C*************** SPECIFICATION STATEMENTS                              WSHE  6
C                                                                       WSHE  7
      COMMON NW,NG,NIN,HISTOG,TRAIN,DELT,DELT2,NOW,NOG,NSTEP,TAREA,     WSHE  8
     1 TIME,TIME2,RI,RLOSS,SUMR,SUMI,SUMOFF,SUMST,TZERO,NING            WSHE  9
      COMMON WFLOW(160),WWIDTH(160),WAREA(160),WSLOPE(160),WN(160),     WSHE 10
     1 WSTORE(160,3),WLMAX (160),WLMIN(160),DECAY(160),WDEPTH(160,3),   WSHE 11
     2 WCON(160,3),NAMEW(160),PCIMP(160)                                WSHE 12
      COMMON GFLOW(160),GWIDTH(160),GLEN(160),GSLOPE(160),GS1(160),     WSHE 13
     1 GS2(160),GN(160),GDEPTH(160),GCON(160),NPG(160),DFULL(160),      WSHE 14
     2 NGUT(160),SUMQW(160),PCTZER                                      WSHE 15
      COMMON NWTOG(160,10),NGTOG(160,10),NWTOI(10),NGTOI(160)           WSHE 16
      COMMON RAIN(160,10),NHYET(160),NRAIN,NRGAG,NHISTO,THISTO          WSHE 17
      COMMON QSUR(160),DELD(160),QIN(160)                               WSHE 18
      COMMON IPRNT(160),ISAVE(160),NPRNT,NSAVE,OUTFLW(160),INTERV,      WSHE 19
     1 INTCNT                                                           WSHE 20
C                                                                       WSHE 21
C******* SELECT AVERAGE RAINFALL DURING TIME INTERVAL                   WSHE 22
C                                                                       WSHE 23
      IND=1.+(TIME2-TZERO)/HISTOG                                       WSHE 24
C                                                                       WSHE 25
C******* BEGIN MAJOR LOOP FOR WSHED                                     WSHE 26
C                                                                       WSHE 27
      DO 320 N=1,NOW                                                    WSHE 28
      J=NAMEW(N)                                                        WSHE 29
      RI=0.                                                             WSHE 30
      NGAG=NHYET(J)                                                     WSHE 31
      IF(TIME2.LE.TRAIN) RI=RAIN(IND,NGAG)                              WSHE 32
      DELR=0.                                                           WSHE 33
      WFLOW(J)=0.                                                       WSHE 34
      IF(WAREA(J).EQ.0.) GO TO 320                                      WSHE 35
      DO 315 K=1,3                                                      WSHE 36
      IF(K-2) 201,205,210                                               WSHE 37
  201 WAR=WAREA(J)*PCIMP(J)/10000. *(100.-PCTZER)                       WSHE 38
      RLOSS=0.                                                          WSHE 39
      GO TO 220                                                         WSHE 40
  205 WAR=WAREA(J)*(100.-PCIMP(J))/100.                                 WSHE 41
      RLOSS=WLMIN(J)                                                    WSHE 42
      GO TO 215                                                         WSHE 43
  210 WAR=WAREA(J)*PCIMP(J)/10000.*PCTZER                               WSHE 44
      RLOSS=0.                                                          WSHE 45
      GO TO 220                                                         WSHE 46
C                                                                       WSHE 47
C******** COMPUTE AVERAGE INFILTRATION DURING TIME INTERVAL             WSHE 48
C                                                                       WSHE 49
  215 EXPON=DECAY(J)*TIME2                                              WSHE 50
      IF(EXPON.LT.60.) RLOSS=RLOSS+(WLMAX(J)-WLMIN(J))/EXP(EXPON)       WSHE 51
      IF((RI-RLOSS)*DELT+WDEPTH(J,K) .GT.0.) GO TO 220                  WSHE 52
C                                                                       WSHE 53
C******** INFILTRATION LOSS EXCEEDS AVAILABLE WATER                     WSHE 54
      RLOSS=RI+WDEPTH(J,K)/DELT                                         WSHE 55
      WDEPTH(J,K)=0.                                                    WSHE 56
      WFLO=0.                                                           WSHE 57
      GO TO 310                                                         WSHE 58
C                                                                       WSHE 59
C******** COMPUTE CHANGE IN DEPTH (NEWTON-RAPHSON)                      WSHE 60
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```
C                                                                       WSHE 61
  220 IF((RI-RLOSS)*DELT+WDEPTH(J,K).LE.WSTORE(J,K)) GO TO 285          WSHE 62
      DO 260 I=1,11                                                     WSHE 63
      DO=WDEPTH(J,K)-WSTORE(J,K)+0.5*DELR                               WSHE 64
      IF(DO.LT.0.) DO=0.                                                WSHE 65
      F=DELR-DELT*(WCON(J,K)*DO**1.6666667+(RI-RLOSS))                  WSHE 66
      DF=1.-DELT*(0.83333333*WCON(J,K)*DO**0.6666667)                   WSHE 67
      DEL=DELR-F/DF                                                     WSHE 68
      IF(I.EQ.1) GO TO 240                                              WSHE 69
      IF((ABS(DEL-DELR)).LT.(ABS(0.01*DELR))) GO TO 280                 WSHE 70
  240 DELR=DEL                                                          WSHE 71
  260 CONTINUE                                                          WSHE 72
      IF(DELR.LT..0001*WDEPTH(J,K)) GO TO 280                           WSHE 73
      WRITE(6,1000) TIME,J,WDEPTH(J,K),DELR                             WSHE 74
 1000 FORMAT(' CHECK RESULTS.  NO CONVERGENCE IN *WSHED*'F8.0,I6,2E12.5)WSHE 75
  280 DCORR=WDEPTH(J,K)+DEL                                             WSHE 76
      DELR=0.                                                           WSHE 77
C                                                                       WSHE 78
C******** AVERAGE FLOW DURING TIME INTERVAL                            WSHE 79
C                                                                       WSHE 80
      WFLO=(RI-RLOSS)*WAR-(DCORR-WDEPTH(J,K))*WAR/DELT                  WSHE 81
      IF(WFLO.GT.0.) GO TO 290                                          WSHE 82
  285 WFLO=0.                                                           WSHE 83
      DCORR=WDEPTH(J,K)+(RI-RLOSS)*DELT                                 WSHE 84
C                                                                       WSHE 85
C******** TRANSFER DEPTH FOR NEXT TIME INTERVAL                        WSHE 86
C                                                                       WSHE 87
  290 WDEPTH(J,K)=DCORR                                                 WSHE 88
C******* SUM FOR CONTINUITY CHECK                                       WSHE 89
  310 SUMR=SUMR+RI*DELT*WAR                                             WSHE 90
      SUMI=SUMI+RLOSS*DELT*WAR                                          WSHE 91
      WFLOW(J)=WFLOW(J)+WFLO                                            WSHE 92
  315 CONTINUE                                                          WSHE 93
  320 CONTINUE                                                          WSHE 94
C                                                                       WSHE 95
      RETURN                                                            WSHE 96
      END                                                               WSHE 97
```

```
      SUBROUTINE SFQUAL                                                 SFQU  1
C=========METCALF & EDDY ENGINEERS' SURFACE QUALITY MODEL============SFQU  2
C                                                                       SFQU  3
      COMMON /TAPES/ INCNT,IOUTCT,JIN(10),JOUT(10),NSCRAT(5)            SFQU  4
      COMMON NB,NG,NIN,HISTCG,TRAIN,DELT,DELT2,NOW,NOG,NSTEP,TAREA,     SFQU  5
     1 TIME,TIME2,RI,RLOSS,SUMR,SUMI,SUMOFF,SUMST,NSHED,NING            SFQU  6
      COMMON KNUM(160),INPUT(160),ASUB(160),GUTTER(160),KLAND(160)  ,   SFQU  7
     *           TOTDD(160),REMDD(160),                                 SFQU  8
     *           PO(160),                                               SFQU  9
     *           RUNCFS(2,160),AVGFLO(160),                             SFQU 10
     *           POP(160),PUPSS(160),                                   SFQU 11
     *           CBSUM(160),CBLBS(2,160),CBINC(160),                    SFQU 12
     *           CBAST(160),ATOT(160),C(160)                            SFQU 13
     *          ,SFCOLI(160),IKOUNT(160),CCOLI(160),TCCOLI(160)         SFQU 14
      COMMON JN(160),RUNTMP(160),IPCINT(160),BOD(160),SS(160)           SFQU 15
      COMMON TITLE(40)                                                  SFQU 16
      COMMON TPCPSS(160),TCBINC(160),TCBAST(160),TPOP(160)              SFQU 17
      DATA NOLAL/3/                                                     SFQU 18
C  READ NUMBER OF SUBAREAS , TIME INTERVAL IN MINUTES, AND STARTING TIMESFQU 19
C     OF STORM.                                                         SFQU 20
      READ(C5,2CC)KTNUM,NINLTS,DT,KHOUR,KMIN,NTSTEP,NPRINT              SFQJ 21
  200 FORMAT(2I5,F5.0,4I5)                                              SFQU 22
      IFPRNT=NSCRAT(3)                                                  SFQU 23
      REWIND IFPRNT                                                     SFQJ 24
      WRITE(C6,601) KTNUM,NINLTS,DT,KHOUR,KMIN                          SFQU 25
  601 FORMAT('1NUMBER OF SUBAREAS, KTNUM =', I4, /                      SFQJ 26
     *       ' NUMBER OF INLETS,  NINLTS =', I4,/                       SFQU 27
     *       ' TIME INTERVAL (MIN),   DT =', F6.2, /                    SFQU 28
     *       ' STORM START TIME (HR:MIN) =', I3, ':', I2)               SFQU 29
C  READ IN DATA FOR ESTIMATING AVAILABLE BOD AND DUST AND DIRT          SFQU 30
      READ(C5,2C1) DRYDAY,CLFREQ,NOPASS                                 SFQU 31
  201 FORMAT (2F10.0,I5)                                                SFQU 32
      WRITE(C6,602) DRYDAY,CLFREQ,NOPASS                                SFQU 33
  602 FORMAT('0DRYDAY =', F10.0, ', CLFREQ=', F10.0, ', NOPASS =', I5)  SFQU 34
      IF(DRYDAY-CLFREQ) 10,10,11                                        SFQU 35
   11 CLEAN=DRYDAY/CLFREQ                                               SFQJ 36
      NCLEAN=CLEAN                                                      SFQU 37
      IF(NOPASS-2) 13,14,15                                             SFQU 38
   13 IF(CLFREQ.GT.15.) REFF=0.60                                       SFQU 39
      IF(CLFREQ.LE.15.) REFF=0.70                                       SFQU 40
      IF(CLFREQ.LE.7.) REFF=0.75                                        SFQU 41
      GO TO 10                                                          SFQU 42
   14 IF(CLFREQ.GT.15.) REFF=0.88                                       SFQU 43
      IF(CLFREQ.LE.15.) REFF=0.92                                       SFQU 44
      IF(CLFREQ.LE.7.) REFF=0.95                                        SFQU 45
      GO TO 10                                                          SFQU 46
   15 REFF=0.98                                                         SFQU 47
   10 CONTINUE                                                          SFQU 48
                                                                        SFQU 49
C  CATCHBASIN CONTRIBUTIONS                                             SFQU 50
C  READ CB DENSITY (AVE NO PER ACRE), CONCENTRATION OF BOD IN MG/L      SFQU 51
C     AND STORED VOLUME OF LIQUID IN GALLONS                            SFQU 52
      READ(05,210) CBDEN,CBBCD,CBVOL                                    SFQU 53
  210 FORMAT(3F10.0)                                                    SFQU 54
      WRITE(C6,603) CBDEN, CBBOC, CBVOL                                 SFQU 55
  603 FORMAT('CAVERAGE NO. CB/ACRE,    CBDEN =', F10.0,/                SFQU 56
     *       ' CB CONTENTS BOD (MG/L), CBBOD =', F10.0, /               SFQU 57
     *       ' CB STORED VOLUME (GAL), CBVOL =', F10.0 )                SFQU 58
      IF(CBDEN.EQ.0.0) GO TO 19                                         SFQU 59
      POOCB=CBVCL*CBBCD*8.34/1000000.                                   SFQU 60
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C  POOCB=LBS BCD AVAIL IN EACH CB AT START OF STORM                    SFQU 61
C  CB'S ARE EXPECTED TO HAVE A CONSTANT CONCENTRATION REGARDLESS OF     SFQU 62
C  LAND USE                                                           SFQU 63
C     IF DRYDAY IS GREATER THAN 1.0                                   SFQU 64
      IF(DRYDAY.GE.1) GO TO 19                                        SFQU 65
      POOCB=SQRT(DRYDAY)*POOCB                                        SFQU 66
   19 CONTINUE                                                        SFQU 67
C                                                                     SFQU 68
C                                                                     SFQU 69
      WRITE(06,778)                                                   SFQU 70
  778 FORMAT('CKNUM/INPUT/KLAND    ASUB    GUTTER')                   SFQU 71
      DO 300 K=1,KTAUP                                                SFQU 72
      READ(05,202) KNUM(K),INPUT(K),KLAND(K),ASUB(K),GUTTER(K)        SFQU 73
      WRITE(6,202) KNUM(K),INPUT(K),KLAND(K),ASUB(K),GUTTER(K)        SFQU 74
  202 FORMAT (3I5,2F10.2)                                             SFQU 75
C  GUTTER EQUALS GUTTER LENGTH IN 100'S OF FEET. DD=DUST AND DIRT     SFQU 76
C     ACCUMULATION PER DAY. FACTORS ARE FROM CHICAGO APWA STUDY.      SFQU 77
      IF(KLAND(K).EQ.1) DD   =0.7*GUTTER(K)                           SFQU 78
      IF(KLAND(K).EQ.2) DD   =2.3*GUTTER(K)                           SFQU 79
      IF(KLAND(K).EQ.3) DD   =3.3*GUTTER(K)                           SFQU 80
      IF(KLAND(K).EQ.4) DD   =4.6*GUTTER(K)                           SFQU 81
      IF(KLAND(K).EQ.5) DD   =1.5*GUTTER(K)                           SFQU 82
      IF(DRYDAY-CLFREQ) 16,16,17                                      SFQU 83
   16 TOTDD(K)=DRYDAY*DD                                              SFQU 84
      GO TO 18                                                        SFQU 85
C  GS IS A FACTOR IN A GEOMETRIC SERIES                               SFQU 86
C  TGS IS THE SUM OF THIS GEOMETRIC SERIES PLUS 1.0                   SFQU 87
   17 TGS=1.00                                                        SFQU 88
      DO 99 IK=1,NCLEAN                                               SFQU 89
      GS=(1.00-REFF)**IK                                              SFQU 90
      TGS=TGS+GS                                                      SFQU 91
   99 CONTINUE                                                        SFQU 92
      TOTDD(K)=CLFREQ*DD*TGS                                          SFQU 93
C  DRYDAYS MUST BE ADJUSTED TO ALLOW FOR CARRYOVER FOR EARLIER STORMS SFQU 94
C  TOTDD IS AVAILABLE DUST AND DIRT AT START OF STORM IN POUNDS       SFQU 95
C  AVAILABLE BOD COMPUTATION FOLLOWS                                  SFQU 96
   18 IF(KLAND(K).EQ.1) SFBOD   =5.0*TOTDD(K)/1000.                   SFQU 97
      IF(KLAND(K).EQ.2) SFBOD   =3.6*TOTDD(K)/1000.                   SFQU 98
      IF(KLAND(K).EQ.3) SFBOD   =7.7*TOTDD(K)/1000.                   SFQU 99
      IF(KLAND(K).EQ.4) SFBOD   =3.0*TOTDD(K)/1000.                   SFQU100
      IF(KLAND(K).EQ.5) SFBOD   =5.0*TOTDD(K)/1000.                   SFQU101
C  SFBOD IS AVAILABLE SOLUABLE BOD CONTAINED IN THE DUST AND DIRT AT  SFQU102
C  THE START OF THE STORM ON THE SURFACE IN POUNDS.                   SFQU103
      PO(K)=SFBOD                                                     SFQU104
      REMDD(K)=TOTDD(K)                                               SFQU105
C  REMDD = REMAINING DUST AND DIRT FROM PREVIOUS TIME STEP            SFQU106
  300 CONTINUE                                                        SFQU107
      A=0.0004*DT                                                     SFQU108
      B=0.0025*DT                                                     SFQU109
      TMINS=DT                                                        SFQU110
C           = TIME INTERVAL IN MINUTES                                SFQU111
      TSEC=TMINS*60.0                                                 SFQU112
      T=TMINS/60.0                                                    SFQU113
      CONVER=1000000.0/(3600.0*T*62.4)                                SFQU114
      CONV2=60.0*283.2                                                SFQU115
C  CONV2 CONVERTS FLOW IN CFS TO FLOW IN 100ML/MIN                    SFQU116
C                                                                     SFQU117
C                                                                     SFQU118
      IAPT=ASCRAT(1)                                                  SFQU119
      REWIND IAPT                                                     SFQU120
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      READ(INPT) NCW,(JN(N),N=1,NOW)                                    SFQU121
      IF(NOW.NE.NINLTS) STOP                                            SFQJ122
      DO 1260 N=1,NINLTS                                                SFQU123
      TPOP(N)=0.0                                                       SFQU124
      TPOPSS(N)=0.0                                                     SFQU125
      TCBAST(N)=0.0                                                     SFQU126
      TCBINC(N)=0.0                                                     SFQU127
      J=1                                                               SFQU128
      DO 1245 K=1,KTNUM                                                 SFQU129
      CCOLI(K)=0.0                                                      SFQU130
      TCCOLI(K)=0.0                                                     SFQU131
      IKOUNT(K)=0                                                       SFQU132
      IF(JN(N)-INPUT(K))1240,1250,1240                                  SFQU133
 1240 IF(K.EQ.KTNUM) GO TO 1245                                         SFQU134
      IF(INPUT(K+1).NE.INPUT(K)) J=J+1                                  SFQU135
 1245 CONTINUE                                                          SFQU136
 1250 IPOINT(N)=J                                                       SFQJ137
 1260 CONTINUE                                                          SFQU138
      J=1                                                               SFQU139
      DO 1270 K=1,KTNUM                                                 SFQU140
      JN(J)=INPUT(K)                                                    SFQU141
      IF(K.EQ.KTNUM)GO TO 1270                                          SFQJ142
      IF(INPUT(K+1).NE.INPUT(K)) J=J+1                                  SFQU143
 1270 CONTINUE                                                          SFQU144
      TZERO=0.                                                          SFQU145
      TZERO=3600.*FLOAT(KHOUR)+60.*FLOAT(KMIN)                          SFQU146
      NOUT=JOUT(ICUTCT)                                                 SFQJ147
      REWIND NCUT                                                       SFQU148
      TIME=TZERO                                                        SFQU149
      READ(NOUT) TITLE                                                  SFQU150
      REWIND NCUT                                                       SFQU151
      WRITE(NCUT)(TITLE(I),I=1,40)                                      SFQJ152
      WRITE(NOUT) NTSTEP,NINLTS,NQUAL,TSEC,TZERO,TAREA                  SFQJ153X
      WRITE(NOUT) (JN(K),K=1,NINLTS)                                    SFQU154
      WRITE(06,779)                                                     SFQJ155
  779 FORMAT('1  TIME',9X,'RUNOFF IN CFS AT SELECTED POINTS          BODSFQU156
     * AT SELECTED POINTS                  SUSPENDED SOLIDS AT SELECTED POSFQJ157
     *INTS')                                                            SFQJ158
        WRITE(06,780)((JN(IA),IA=1,4),KK=1,3)                           SFQJ159
  780 FORMAT(' ',6X,12I10)                                              SFQU160
      NOLD=1                                                            SFQU161
      NEW=2                                                             SFQU162
      TIMES=TZERO                                                       SFQJ163
      MKOUNT=0                                                          SFQU164
      DO 444 KTSTEP=1,NTSTEP                                            SFQU165
      MKOUNT=MKOUNT+1                                                   SFQU166
      IF(MKOUNT.GT.NPRINT) MKOUNT=1                                     SFQU167
      TIMES=TIMES+TSEC                                                  SFQJ168
      J=1                                                               SFQU169
C  READ RUNOFF VALUES AT INCREMENTS =DT                                 SFQJ170
      READ(INPT)(RUNTMP(N),N=1,NINLTS)                                  SFQU171
      DO 203 N=1,NINLTS                                                 SFQU172
      K=IPOINT(N)                                                       SFQU173
  203 RUNCFS(NEW,K)=RUNTMP(N)                                           SFQU174
      DO 222 I=1,NINLTS                                                 SFQJ175
C     CALCULATE AVERAGE RUNOFF IN TIME INTERVAL                         SFQU176
      IF(KTSTEP.EQ.1) AVGFLO(I)=RUNCFS(NEW,I)/2.0                       SFQU177
      IF(KTSTEP.GT.1)AVGFLO(I)=(RUNCFS(NOLD,I)+RUNCFS(NEW,I))/2.0       SFQU178
      IF(KTSTEP.EQ.1) ATOT(I)=0.0                                       SFQU179
      POPSS(I)=0.0                                                      SFQU180
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      CBASTM(I)=0.0                                                     SFQU181
      RUNCFS(NCLD,I)=RUNCFS(NEW,I)                                      SFQU182
  222 CONTINUE                                                          SFQU183
      DO 333 JJ=1,KTNUM                                                 SFQU184
      SFCOLI(JJ)=0.0                                                    SFQU185
      IKOUNT(J)=IKOUNT(J)+1                                             SFQU186
C     ...CONVERT RUNOFF FROM CFS TO INCHES/HOUR...                      SFQU187
      IF(KTSTEP.GT.1) GO TO 224                                         SFQJ188
      JK=JJ+1                                                           SFQU189
      DO 223 JKL=1,5                                                    SFQU190
      IF(ATOT(J).EQ.0.0) ATOT(J)=ASUB(JJ)                               SFQU191
      IF(JK.GT.KTNUM) GO TO 224                                         SFQU192A
      IF(INPUT(JK).NE.INPUT(JJ)) GO TO 224                              SFQU193
      ATOT(J)=ATOT(J)+ASUB(JK)                                          SFQU194
      JK=JK+1                                                           SFQJ195
  223 CONTINUE                                                          SFQU196
  224 IF(ATOT(J).GT.0.0) GO TO 226                                      SFQU197
      RUNOFF=0.0                                                        SFQU198
      GO TO 225                                                         SFQU199
  226 RUNOFF=AVGFLO(J)/ATOT(J)                                          SFQU200
  225 IF(KTSTEP.EQ.1) C(JJ)=0.90                                        SFQU201
      IF(KTSTEP.EQ.1) CBSUM(JJ)=0.0                                     SFQU202
      IF(GUTTER(JJ).EQ.0.0) GO TO 22                                    SFQJ203
      ERT=EXP(-4.6*RUNOFF*T)                                            SFQU204
      P=PO(JJ)*ERT                                                      SFQJ205
      IF(RUNOFF.LE.0.0) GO TO 22                                        SFQU206
      C(JJ)=C(JJ)-0.0025*DT                                             SFQU207
      IF(C(JJ).LT.0.25) C(JJ)=0.25                                      SFQJ208
      POP(JJ)=PO(JJ)-P                                                  SFQU209
      D=2.60-1.25*RUNOFF**0.5                                           SFQJ210
      IF(RUNOFF.GE.1.0) D=1.0                                           SFQU211
      E=100.0*RUNOFF                                                    SFQJ212
      IF(E.GT.300.0)E=300.0                                             SFQJ212A
      AVAIL=0.057+1.4*RUNOFF**1.1                                       SFQU213
      IF(AVAIL.GT.0.75) AVAIL=0.75                                      SFQU213A
C     POPSS(JJ)=AVAIL*REMDD(JJ)*(1.0-ERT)                              SFQU214
      POPSS(JJ)=ASUB(JJ)*(A*E+B*E**D)*C(JJ)*REMDD(JJ)/TOTDD(JJ)         SFQJ215
C  POPSS(KTSTEP,JJ)=POUNDS OF SS REMOVED DURING TIME DT                 SFQJ216
C  SUBSCRIPT JJ IS SUBAREA (COMMON LAND USE) FROM WHICH SOLIDS ARE      SFQU217
C  REMOVED.                                                             SFQU218
      F=POPSS(JJ)                                                       SFQU219
      IF(F.GE.C(JJ)*REMDD(JJ)) POPSS(JJ)=C(JJ)*REMDD(JJ)                SFQU220
      IF(KLAND(J).EQ.1)SFCOLI(JJ)=590000000*POPSS(JJ)/DT                SFQJ221
      IF(KLAND(J).EQ.2)SFCOLI(JJ)=1220000000*POPSS(JJ)/DT               SFQU222
      IF(KLAND(J).EQ.3)SFCOLI(JJ)=770000000*POPSS(JJ)/DT                SFQU223
      IF(KLAND(J).GE.4)SFCOLI(JJ)=454000000*POPSS(JJ)/DT                SFQU224
C  SFCOLI IS TOTAL COLIFORMS IN RUNOFF IN MPN/MIN                       SFQU225
      CCOLI(JJ)=SFCOLI(JJ)/(AVGFLO(J)*CONV2)                           SFQJ226
      TCCOLI(JJ)=TCCOLI(JJ)+CCOLI(JJ)                                   SFQJ227
      BODNS=0.05*POPSS(JJ)                                              SFQU228
      POP(JJ)=POP(JJ)+BODNS                                             SFQU229
C  CATCHBASIN CONTRIBUTIONS                                             SFQU230
      IF(CBDEN.EQ.0.0) GO TO 20                                         SFQJ231
      CBNUM=CBDEN*ASUB(JJ)                                              SFQU232
      POCB=CBNUM*POUCB                                                  SFQU233
      DRAIN=(RUNOFF*ASUB(JJ) *TSEC*7.48)/CBNUM                          SFQU234
C  DRAIN = DRAINAGE IN GALLONS TO EACH CATCHBASIN                       SFQU235
      CBSUM(JJ)=CBSUM(JJ)+DRAIN                                         SFQJ236
      CBCENT=(1.0-EXP(-CBSUM(JJ)/(1.5*CBVOL)))                          SFQU237
C  CBCENT IS PERCENT OF POLLUTION REMOVED/100.                          SFQU238
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      CBLBS(NEW,JJ)=CBCENT*POCB                                          SFQU239
      IF(KTSTEP.EQ.1) CBINC(JJ)=CBLBS(NEW,JJ)                            SFQU240
      IF(KTSTEP.GT.1) CBINC(JJ)=CBLBS(NEW,JJ)-CBLBS(NOLD,JJ)             SFQU241
      GO TO 21                                                           SFQU242
   20 CBINC(JJ)=C.0                                                      SFQU243
   21 CONTINUE                                                           SFQU244
C  PRESENT COMPUTATIONS ASSUME CBS EFFECT ONLY BOD                       SFQU245
C                                                                        SFQU246
C                                                                        SFQU247
      GO TO 23                                                           SFQU248
   22 POP(JJ)=0.0                                                        SFQU249
      IF(KTSTEP.GT.1) GO TO 98                                           SFQU250
      CBLBS(NEW,JJ)=0.0                                                  SFQU251
   98 POPSS(JJ)=0.0                                                      SFQU252
      CBINC(JJ)=C.0                                                      SFQU253
      IF(KTSTEP.EQ.1) GO TO 505                                          SFQU254
      CBLBS(NEW,JJ)=CBLBS(NOLD,JJ)                                       SFQU255
  505 CBSUM(JJ)=CBSUM(JJ)                                                SFQU256
      GO TO 23                                                           SFQU257
   29 POP(JJ)=C.C                                                        SFQU258
      POPSS(JJ)=0.0                                                      SFQU259
      CBINC(JJ)=0.0                                                      SFQU260
   23 CONTINUE                                                           SFQU261
      CBLBS(NOLD,JJ)=CBLBS(NEW,JJ)                                       SFQU262
      PO(JJ)=P                                                           SFQU263
      REMDO(JJ)=REMDO(JJ)-POPSS(JJ)                                      SFQU264
      CBASTM(JJ)=CBINC(JJ)+POP(JJ)                                       SFQU265
      IF(JJ.EQ.1) GO TO 330                                              SFQU266
      IF(INPUT(JJ-1).EQ.INPUT(JJ)) GO TO 332                             SFQU267
C  THIS IS A NEW INLET                                                   SFQU268
      POPSS(J)=POPSS(JJ)                                                 SFQU269
      CBINC(J)=CBINC(JJ)                                                 SFQU270
      POP(J)=POP(JJ)                                                     SFQU271
      CBASTM(J)=CBASTM(JJ)                                               SFQU272
      SFCOLI(J)=SFCOLI(JJ)                                               SFQU273
      TCCOLI(J)=TCCOLI(JJ)                                               SFQU274
      CCOLI(J)=CCCLI(JJ)                                                 SFQU275
      GO TO 330                                                          SFQU276
  332 CONTINUE                                                           SFQU277
      POPSS(J)=POPSS(J)+POPSS(JJ)                                        SFQU278
      CBINC(J)=CBINC(J)+CBINC(JJ)                                        SFQU279
      POP(J)=POP(J)+POP(JJ)                                              SFQU280
      CBASTM(J)=CBASTM(J)+CBASTM(JJ)                                     SFQU281
      SFCOLI(J)=SFCOLI(J)+SFCOLI(JJ)                                     SFQU282
      TCCOLI(J)=TCCOLI(J)+TCCOLI(JJ)                                     SFQU283
      CCOLI(J)=CCOLI(J)+CCOLI(JJ)                                        SFQU284
  330 CONTINUE                                                           SFQU285
      IF(KTSTEP.EQ.NTSTEP)  KNUM(J)=INPUT(JJ)                            SFQU286
      IF(JJ.EQ.KTNUM) GO TO 333                                          SFQU287
      IF(INPUT(JJ+1).NE.INPUT(JJ)) J=J+1                                 SFQU288
  333 CONTINUE                                                           SFQU289
      DO 440 J=1,NINLTS                                                  SFQU290
      BOD(J)=CBASTM(J) /DT                                               SFQU291
      IF(NPRINT.EQ.0) GO TO 440                                          SFQU292
      IF(KTSTEP.EQ.1) GO TO 439                                          SFQU293
      IF(MKOUNT.LT.NPRINT) GO TO 440                                     SFQU294
  439 WRITE(IFPRNT)RUNOFS(NEW,J),AVGFLO(J),POPSS(J),CBINC(J),POP(J),CBASSFQU295
     *TM(J),CCCLI(J)                                                     SFQU296
  440 SS(J)=POPSS(J) /DT                                                 SFQU297
      WRITE(NOUT) TIMES,(RUNOFS(NEW,J),J=1,NINLTS),(BOD(J),SS(J),SFCOLI(SFQU298
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     *J),J=1,NINLTS)                                                    SFQU299
      DO 442 J=1,NINLTS                                                 SFQU300
      TPOP(J)=TPOP(J)+POP(J)                                            SFQU301
      TPOPSS(J)=TPOPSS(J)+POPSS(J)                                      SFQU302
      TCBAST(J)=TCBAST(J)+CBASTM(J)                                     SFQU303
      TCBINC(J)=TCBINC(J)+CBINC(J)                                      SFQU304
      BOD(J)=BOD(J)*DT                                                  SFQU305
  442 SS(J)=SS(J)*DT                                                    SFQU306
      WRITE(6,7C93) TIMES,(RUNOFS(NEW,IA),IA=1,4),(BOD(IA),IA=1,4),     SFQU307
     1(SS(IA),IA=1,4)                                                   SFQU308
 7C93 FORMAT(' ',F8.0,12F10.2)                                          SFQU309
  444 CONTINUE                                                          SFQU310
      KSKIP=C                                                           SFQU311
      LL=1                                                              SFQJ312
      KOUNT=0                                                           SFQU313
      TTPPSS=0.0                                                        SFQU314
      TTCBNC=0.0                                                        SFQU315
      TTPOP=C.C                                                         SFQU316
      TTCBST=0.0                                                        SFQJ317
      TSUMDD=0.0                                                        SFQU318
      TSMBD=C.C                                                         SFQU319
      TSUMCB=C.0                                                        SFQU320
      TBOD=0.0                                                          SFQU321
      WRITE(6,614)NTSTEP                                                SFQJ322
 --4 FORMAT('1',10X,'TOTAL QUANTITIES TRANSFERRED TO THE SEWER FROM THESFQU323
     * INDICATED AREAS DURING',I4,' TIME STEPS',//)                     SFQU324
 630 FORMAT('0',T20,' KLAND',T38,'TYPE OF LAND USE'/' ',T20,'-------', SFQU325
     *T32,'-------------------------'/'0',T23,'1',T33,'SINGLE FAMILY RSFQJ326
     *ESIDENTIAL'/'0',T23,'2',T33,'MULTI-FAMILY RESIDENTIAL'/'0',T23,'3'SFQU327
     *,T33,'COMMERCIAL'/'0',T23,'4',T33,'INDUSTRIAL'/'0',T23,'5',T33,'UNSFQU328
     *DEVELOPED OR PARKLAND',////)                                      SFQU329
      WRITE(6,605)                                                      SFQU330
 605 FORMAT(' ',T89,'A M O U N T    T R A N S F E R R E D'/' ',T82,'---SFQU331
     *----------------------------------------'/' ',T124,'AVERAGESFQU332
     *'/' ',T54,'BOD PRIOR TO STORM, LBS.',T83,'SUSPENDED',T123,'COLIFORSFQU333
     *M'/' ',T9,'LAND',T40,'DUST & DIRT',T52,'-------------------------SFQJ334
     *----',T84,'SOLIDS',T95,'F I V E  D A Y  B O D',T125,'CONC.'/' ',T9SFQU335
     *,'USE',T19,'AREA',T26,'GUTTER LENGTH  PRIOR TO',T65,'NON-',T76,'INSFQU336
     *',T84,'(PCPSS)   (CBINC) + (POP)  = (CBASTM)   (CCOLI)'/' ',T2,'INSFQU337
     *PUT (KLAND)   ACRES   HUNDRED FEET  STORM, LBS.   SOLUBLE   SOLUBLSFQU338
     *E CATCHBASIN  POUNDS    POUNDS    POUNDS    POUNDS   MPN/100ML'/' SFQU339
     *','-------------------------------------------------------------SFQU340
     *-------------------------------------------------------------SFQJ341
     *--'/)                                                          SFQJ342
      DO 666 J=1,NINLTS                                                 SFQU343
      SUMDD = C.0                                                       SFQJ344
      SUMBOD = 0.0                                                      SFQU345
      SUMCB = 0.0                                                       SFQU346
      IF(NPRINT.NE.0) GO TO 613                                         SFQJ347
      GO TO 615                                                         SFQU348
 613 WRITE(06,209)  KNUM(J),NTSTEP                                      SFQU349
 209 FORMAT('1'/10X,'TOTAL QUANTITIES REMOVED FROM THE AREA SERVING INPSFQU350
     *UT NO. ',I3,','/32X,'DURING ',I3,' TIME STEPS'//)                SFQU351
 615 CONTINUE                                                           SFQU352
      DO 334 KL=LL,KTNUM                                                SFQU353
      KK=KL                                                             SFQJ354
 335 IF(KLAND(KK).EQ.1) SFBOD=5.0*TOTDD(KK)/1000.                       SFQU355
      IF(KLAND(KK).EQ.2) SFBOD=3.6*TOTDD(KK)/1000.                      SFQU356
      IF(KLAND(KK).EQ.3) SFBOD=7.7*TOTDD(KK)/1000.                      SFQU357
                                                                        SFQU358
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      IF(KLAND(KK).EQ.4) SFBOD=3.0*TOTDD(KK)/1000.                          SFQU359
      IF(KLAND(KK).EQ.5) SFBOD=5.0*TOTDD(KK)/1000.                          SFQU360
      BODNS=TOTDD(KK)*0.05                                                  SFQU361
      POCB=POCCB*CBDEN*ASUB(KK)                                             SFQU362
      SUMDD=SUMDD+TOTDD(KK)                                                 SFQU363
      SUMBOD=SUMBOD+BODNS+SFBOD                                             SFQU364
      SUMCB=SUMCB+POCB                                                      SFQU365
  341 CONTINUE                                                              SFQU366
      IF(KOUNT.NE.KTNUM) KOUNT=KK+1                                         SFQU367
      IF(KK.EQ.KTNUM) GO TO 334                                             SFQU368
      IF(INPUT(KK+1).EQ.INPUT(KK)) WRITE(6,631)INPUT(KK),KLAND(KK),ASUB(SFQU369
     *KK),GUTTER(KK),TOTDD(KK),SFBOD,BODNS,POCB                             SFQU370
  631 FORMAT(' ',I5,I7,T17,F8.2,T25,F11.2,T39,F11.2,T52,F8.2,T62,F8.2,T7SFQU371
     *2,F8.2)                                                               SFQU372
      IF(INPUT(KK+1).NE.KAUN(J)) GO TO 340                                  SFQU373
  334 CONTINUE                                                              SFQU374
  340 CONTINUE                                                              SFQU375
      LL=KOUNT                                                              SFQU376
      IF(NPRINT.EQ.0) GO TO 660                                             SFQU377
      WRITE(06,610)                                                         SFQU378
  610 FORMAT('0',19X,'SUSPENDED SOLIDS',6X,'FIVE-DAY BIOCHEMICAL OXYGEN SFQU379
     *DEMAND',5X,'COLIFORM CONC.'/' ',1X,'TIME',4X,'RUNOFF',3X,'(POPSS)'SFQU380
     *,2X,'(CONCSS)',3X,'(CBINC)',1X,'+',3X,'(POP)',1X,'=  (CBASTM)   (CSFQU381
     *ONBOD)',8X,'(CCOLI)'/' ',12X,'CFS',4X,'LBS/DT',6X,'MG/L',4X,'LBS/DSFQU382
     *T',4X,'LBS/DT',4X,'LBS/DT',6X,'MG/L',7X,'MPN/100ML')              SFQU383
      IHOUR=KHOUR                                                           SFQU384
      IMIN=KMIN                                                             SFQU385
      REWIND IFPRNT                                                         SFQU386
      IF(KSKIP.EQ.0) GO TO 557                                              SFQU387
      DO 556 MM=1,KSKIP                                                     SFQU388
      READ(IFPRNT) SKIP1,SKIP2,SKIP3,SKIP4,SKIP5,SKIP6,SKIP7                SFQU389
  556 CONTINUE                                                              SFQU390
  557 CONTINUE                                                              SFQU391
      ISKIP=NINLTS-1                                                        SFQU392
      NUSTEP=NTSTEP/NPRINT                                                  SFQU393
      DO 555 KTSTEP=1,NUSTEP                                                SFQU394
      READ(IFPRNT)RUNOFS(NEW,J),AVGFLO(J),POPSS(J),CBINC(J),POP(J),CBASTSFQU395
     *M(J),CCOLI(J)                                                         SFQU396
      IF(KTSTEP.EQ.NUSTEP) GO TO 554                                        SFQU397
      DO 553 N=1,ISKIP                                                      SFQU398
      READ(IFPRNT) SKIP1,SKIP2,SKIP3,SKIP4,SKIP5,SKIP6,SKIP7                SFQU399
  553 CONTINUE                                                              SFQU400
  554 CONTINUE                                                              SFQU401
      IF(KTSTEP.EQ.1) GO TO 303                                             SFQU402
      IMIN=IMIN+(TMINS*NPRINT)                                              SFQU403
      IF(IMIN.GE.60) IHOUR=IHOUR+1                                          SFQU404
      IF(IMIN.GE.60) IMIN=IMIN-60                                           SFQU405
      IF(IHOUR.GE.25) IHOUR=1                                               SFQU406
  303 IF(AVGFLO(J).GT.0.0) GO TO 301                                        SFQU407
      CONBOD=0.0                                                            SFQU408
      CONCSS=0.0                                                            SFQU409
      GO TO 302                                                             SFQU410
  301 CONTINUE                                                              SFQU411
      CONBOD=CONVER*CBASTM(J)/AVGFLO(J)                                     SFQU412
      CONCSS=CONVER*POPSS(J)/AVGFLO(J)                                      SFQU413
  302 CONTINUE                                                              SFQU414
      WRITE(06,208) IHOUR,IMIN,RUNOFS(NEW,J),POPSS(J),CONCSS,CBINC(J),POSFQU415
     *P(J),CBASTM(J),CONBOD,CCOLI(J)                                        SFQU416
  208 FORMAT(' ',I2,1H:,I2,7F10.2,1PE10.2)                                  SFQU417
      IF(KTSTEP.NE.NUSTEP) GO TO 555                                        SFQU418
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      WRITE(06,611) TPOPSS(J),TCBINC(J),TPOP(J),TCBAST(J)                SFQU419
  611 FORMAT('0',' POUNDS REMOVED',F10.2,10X,3F10.2)                     SFQU420
  555 CONTINUE                                                           SFQU421
      KSKIP=KSKIP+1                                                      SFQJ422
      GO TO 665                                                          SFQJ423
  660 PCNTSS=TPOPSS(J)/SUMDD*100.0                                       SFQU424
      PCTBOD=TPOP(J)/SUMBOD*100.0                                        SFQU425
      PCNTCB=TCBINC(J)/SUMCB*100.0                                       SFQJ426
      TPCBOD=TCBAST(J)/(SUMCB+SUMBOD)*100.0                              SFQJ427
      CCOLI(J)=TCCOLI(J)/IKOUNT(J)                                       SFQU428
C     SUM THE REMOVALS FOR ALL AREAS                                     SFQJ429
      TTPPSS=TTPPSS+TPOPSS(J)                                            SFQJ430
      TTCBNC=TTCBNC+TCBINC(J)                                            SFQU431
      TTPOP=TTPOP+TPOP(J)                                                SFQU432
      TTCBST=TCBAST(J)+TTCBST                                            SFQU433
C     SUM THE ORIGINAL LOAD FOR ALL AREAS                                SFQU434
      TSUMDD=TSUMDD+SUMDD                                                SFQU435
      TSMBD=TSMBD+SUMBOD                                                 SFQU436
      TSUMCB=TSUMCB+SUMCB                                                SFQJ437
      TBOD=TBOD+SUMCB+SUMBOD                                             SFQU438
      WRITE(6,612)INPUT(KK),KLAND(KK),ASUB(KK),GUTTER(KK),TOTDD(KK),SFBOSFQJ439
     *D,BODNS,FCCB,TPCPSS(J),TCBINC(J),TPOP(J),TCBAST(J),CCOLI(J),PCNTSSSFQU440
     *,PCNTCB,PCTBOD,TPCBOD                                              SFQU441
  612 FORMAT(' ',I5,I7,T17,F8.2,T25,F11.2,T39,F11.2,T52,F8.2,T62,F8.2,T7SFQU442
     *2,F8.2,T82,F9.2,T92,F8.2,T102,F8.2,T112,F8.2,T122,1PE9.2/' ',T82,  SFQU443
     *0PF8.1,' %',F7.1,' % ',F7.1,' % ',F7.1,' % '/)                     SFQJ444
  665 CONTINUE                                                           SFQU445
  666 CONTINUE                                                           SFQJ445
  777 CONTINUE                                                           SFQJ447
      IF(NPRINT.GT.0) GO TO 888                                          SFQU448
C     FIND THE TOTAL REMOVALS FOR ALL AREAS, IN PERCENT                  SFQJ449
      TPCTSS=TTPPSS/TSUMDD*100.0                                         SFQU450
      TPCTBD=TTPOP/TSMBD*100.0                                           SFQJ451
      TPCTCB=TTCBNC/TSUMCB*100.0                                         SFQJ452
      TPTBOD=TTCBST/TBOD*100.0                                           SFQJ453
      NEXDAY = 0                                                         SFQU454
      ENDTIM=(FLOAT(KHOUR)+(FLOAT(KMIN))/60.)+(DT*FLOAT(NTSTEP))/60.     SFQJ455
      IF(ENDTIM.GE.25) NEXDAY=NEXDAY+1                                   SFQU456
      IF(ENDTIM.GE.25) ENDTIM=ENDTIM-24                                  SFQJ457
      IF(ENDTIM.GE.25) NEXDAY=NEXDAY+1                                   SFQU458
      IF(ENDTIM.GE.25) ENDTIM=ENDTIM-24                                  SFQJ459
      WRITE(6,616)NTSTEP,TTPPSS,TTCBNC,TTPOP,TTCBST,ENDTIM,NEXDAY,TPCTSSSFQU460
     *,TPCTCB,TPCTBD,TPTBOD                                              SFQU461
  616 FORMAT(' ','-------------------------------------------------------SFQJ462
     *-----------'/'0',5X,'TOTAL TRANSFERRED FROM ALL INLET AREAS DURINSFQJ463
     *G ',I3,' TIMESTEPS',T82,F9.2,T92,F8.2,T102,F8.2,T112,F8.2,/' ',5X,SFQJ464
     *'ENDING AT ',F4.1,' HRS., ',I1,' DAY(S) LATER',T82,F8.1,' %',F7.1,SFQU465
     *' % ',F7.1,' % ',F7.1,' % ',///)                                   SFQU466
  888 CONTINUE                                                           SFQJ467
      WRITE(06,211)                                                      SFQU468
  211 FORMAT(1H1)                                                        SFQJ469
      RETURN                                                             SFQU470
      END                                                                SFQU471
                                                                         SFQJ472
```

Section 3

TRANSPORT BLOCK

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      SUBROUTINE TRANS                                                    TRAN  1
C                                                                         TRAN  2
C*************** UNIVERSITY OF FLORIDA TRANSPORT MODEL*****************  TRAN  3
C                                                                         TRAN  4
C********SPECIFICATION STATEMENTS                                        TRAN  5
C                                                                         TRAN  6
      DIMENSION QI(160),QO(160),SURGE1(160),SURGE2(160),WELL1(160),       TRAN  7
     1 WELL2(160),PUMP(160),G(400),QO1(160),QO2(160),OUTIN(10,5),         TRAN  8
     2 OUT(10,5),OUTTAP(5,5)                                              TRAN  9
      COMMON /TAPES/ INCNT,IOUTCT,JIN(10),JOUT(10),NSCRAT(5)              TRAN 10
      COMMON/DRWF/ CVDWF(7),DVBOD(7),DVSS(7),HVDWF(24),HVBOD(24),         TRAN 11
     1             HVSS(24),HVCOLI(24),KTNUM,KDAY,KHOUR,KMINS            TRAN 12
      COMMON/TABLES/KDEPTH(25),KLASS(25),PSIMAX(15),ALFMAX(15),           TRAN 13
     1              NN(25),MM(25),ANORM(15,51),QNORM(15,51),              TRAN 14
     2              DNORM(15,51),AFACT(15),RFACT(15)                      TRAN 15
      COMMON/NAMES/ NAME(4,25),GNO,YES,BLANK                              TRAN 16
      COMMON A(160,2,2) ,Q(160,2,2) , CPOLL(160,2,2,3), QMAX(160),        TRAN 17
     1       QFULL(160), AFULL(160), DXDT(160),C1(160), SLOPE(160),       TRAN 18
     2       DIST(160), GEOM1(160), ROUGH(160), NUE(160), NUE(160,3),     TRAN 19
     3       INUE(160,3), NTYPE(160), JR(160), NKLASS, NE, NDT, EPSIL,    TRAN 20
     4       TIME, DT, M, KFULL, N, NOS, NPOLL, NPRINT, ITER,             TRAN 21
     5       QDWF(160), IOLD(160), P1(160), RNOFF(160), QINFIL(160),      TRAN 22
     6       WDWF(160,3), PLUTO(160,3), IR(160), P2(160), NIN(1000),      TRAN 23
     7       P5(160),P6(160),P7(160),SCF(160),BARREL(160),                TRAN 24
     8       TITLE(40), NPE(20), NYN(20), NORDER(70), GEOM2(160),         TRAN 25
     9       GEOM3(160) , P4(160),SCOUR(160), KSTORE(160)                 TRAN 26
      COMMON  BODIN( 2,150),SSIN( 2,150),BODOUT,SSOUT,COLIN(2,150),       TRAN 27X
     *  QINST,QOUST,QINSTL( 2),QOUSTL( 2),STORL( 2),QOUTO( 2),STORO( 2),TRAN 28
     *  KSTOR,KSTOR,IPRINT( 2),IPOL( 2),IFLOOD( 2),ICOST( 2),DEPMAX( 2),TRAN 29
     *  A[illegible]RM( 2,11),AO2DT2( 2,11),BDEPTH( 2,11),BSTOR( 2,11),COLOUT,  TRAN 30X
     *  [illegible]MSTR(11),DUMDEP(11),                                  TRAN 31
     *  [illegible]STEP,VOLIN( 2,150),VOLOUT( 2,150),STOR,CUMIN( 2),CUMOUT( 2),  TRAN 32
     *  [illegible]OD( 2),SSS( 2),SCOL( 2),                              TRAN 33X
     *  ISTMOD( 2),ISTTYP( 2),ISTOUT( 2),                                TRAN 34
     *  QPUMP( 2),DSTART( 2),DSTOP( 2),                                  TRAN 35
     *  DTON( 2),STORMX( 2),DTPUMP( 2),DTMORE( 2),STORF( 2),APLAN( 2),   TRAN 36
     *  CLAND( 2),CSTOR( 2),CPS( 2),CTOTAL( 2),CPCUYD( 2),CPACRE( 2),    TRAN 37
     *  LP,JP,LPREV( 2),LABEL,DETENT(150),FRAC(150),OUT1(10,200)         TRAN 38X
      EQUIVALENCE (QO(1),Q(1,2,2)),(QI(1),Q(1,1,2))                       TRAN 39
      EQUIVALENCE (PUMP(1),DIST(1)),(SURGE1(1),P1(1)),(SURGE2(1),P2(1))   TRAN 40
      EQUIVALENCE (QO1(1),QMAX(1)),(QO2(1),QFULL(1))                      TRAN 41
      EQUIVALENCE (WELL1(1),SLOPE(1)),(WELL2(1),ROUGH(1))                 TRAN 42
      DIMENSION JR(5)                                                     TRAN 43
      DIMENSION FLODEP(150)                                               KINGTEMP
C                                                                         TRAN 44
C********READ DATA DESCRIBING USER SUPPLIED CONDUITS, IF ANY.             TRAN 45
C                                                                         TRAN 46
      READ(5,901)NKLASS,KPRINT                                            TRAN 47
      NKLAS=NKLASS +12                                                    TRAN 48
      IF (NKLASS.LE.0)  GO TO 41                                          TRAN 49
      READ (5,903) ((NAME(J,I),J=1,4),I=13,NKLAS)                         TRAN 50
      READ (5,901) (NN(I),I=13,NKLAS)                                     TRAN 51
      READ (5,901) (MM(I),I=13,NKLAS)                                     TRAN 52
      READ (5,900) (ALFMAX(I),I=13,NKLAS)                                 TRAN 53
      READ (5,900) (PSIMAX(I),I=13,NKLAS)                                 TRAN 54
      READ (5,900) (AFACT(I),I=13,NKLAS)                                  TRAN 55
      READ (5,900) (RFACT(I),I=13,NKLAS)                                  TRAN 56
C     READ PARAMENTERS FOR DEPTH-AREA RELATIONSHIPS.                      TRAN 57
      DO 18 I=13,NKLAS                                                    TRAN 58
      KDEPTH(I) = 2                                                       TRAN 59
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      NNN = NN(I)                                                        TRAN 60
      READ (5,900) (DNORM(I,J),J=1,NNN)                                  TRAN 61
      NNN = NNN+1                                                        TRAN 62
      IF (NNN.GT.51) GO TO 18                                            TRAN 63
      DO 17 J=NNN,51                                                     TRAN 64
   17 DNORM(I,J)=0.0                                                     TRAN 65
   18 CONTINUE                                                           TRAN 66
C     READ PARAMETERS AND PERFORM INITIALIZING CALCULATIONS ON Q-A CURVE TRAN 67
      DO 40 I=13,NKLAS                                                   TRAN 68
      KLASS(I) = 2                                                       TRAN 69
C     CONDUIT WITH TABULAR Q-A RELATIONSHIP                              TRAN 70
      MMM = MM(I)                                                        TRAN 71
      DALPHA=1.0/FLOAT(MMM-1)                                            TRAN 72
      READ(5,900)(QNORM(I,J),J=1,MMM)                                    TRAN 73
      ANORM(I,1)=0.0                                                     TRAN 74
      DO 33 J=2,MMM                                                      TRAN 75
   33 ANORM(I,J)=ANORM(I,J-1)+DALPHA                                     TRAN 76
      MMM = MMM+1                                                        TRAN 77
      IF (MMM.GT.51) GO TO 40                                            TRAN 78
      DO 39 J=MMM,51                                                     TRAN 79
      ANORM(I,J) = 0.0                                                   TRAN 80
   39 QNORM(I,J)=0.0                                                     TRAN 81
   40 CONTINUE                                                           TRAN 82
C                                                                        TRAN 83
C********WRITE DATA DESCRIBING DIFFERENT TYPES OF SEWER ELEMENTS(IF      TRAN 84
C        DESIRED)                                                        TRAN 85
   41 CONTINUE                                                           TRAN 86
      IF(KPRINT.NE.1) GO TO 45                                           TRAN 87
      WRITE (6,970)                                                      TRAN 88
      DO 43 I=1,15                                                       TRAN 89
      MMM = MM(I)                                                        TRAN 90
      IF (MM(I).LT.NN(I)) MMM = NN(I)                                    TRAN 91
   43 WRITE (6,971) I,(NAME(J,I),J=1,4),ALFMAX(I),PSIMAX(I),AFACT(I),    TRAN 92
     1 RFACT(I),KDEPTH(I),KLASS(I),(J,ANORM(I,J),QNORM(I,J),DNORM(I,J),  TRAN 93
     2 J=1,MMM)                                                          TRAN 94
      WRITE(6,972)                                                       TRAN 95
      WRITE(6,973)  (I,KDEPTH(I),KLASS(I),(NAME(K,I),K=1,4),I=16,25)     TRAN 96
C                                                                        TRAN 97
C********READ IN DATA FOR EACH SEWER SYSTEM                              TRAN 98
C                                                                        TRAN 99
C     READ IN TITLE FOR DATA.                                            TRAN100
C                                                                        TRAN101
   45 READ(5,903) (TITLE(I),I=1,20)                                      TRAN102
C                                                                        TRAN103
C     READ IN EXECUTION DATA.                                            TRAN104
C                                                                        TRAN105
      READ (5,901) NE,NDT,NINPUT,NNYN,NNPE,NOUTS,NPRINT,NPOLL,NITER     TRAN106
C                                                                        TRAN107
C              NE     = TOTAL NUMBER OF ELEMENTS                         TRAN108
C              NDT    = NUMBER OF TIME STEPS                             TRAN109
C              NINPUT = NUMBER OF INPUT ELEMENTS                         TRAN110
C              NNYN   = NUMBER OF ELEMENTS FOR WHICH INFLOW              TRAN111
C                       PRINTOUT IS DESIRED                              TRAN112
C              NNPE   = NUMBER OF ELEMENTS FOR WHICH OUTFLOW             TRAN113
C                       PRINTOUT IS DESIRED                              TRAN114
C              NOUTS  = NUMBER OF ELEMENTS FOR WHICH OUTFLOW             TRAN115
C                       HYDROGRAPHS AND POLLUTOGRAPHS ARE TO BE          TRAN116
C                       PROVIDED ON TAPE FOR INTERFACING                 TRAN117
C              NPRINT = 0 NO TRACING MESSAGES GENERATED                  TRAN118
C                       1 TRACING MESSAGES ARE GENERATED IN ROUTE        TRAN119
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C                       2 TRACING MESSAGES ARE GENERATED IN ROUTE AND     TRAN120
C                         TRANS                                           TRAN121
C               NPOLL   = NUMBER OF POLLUTANTS TO BE ROUTED               TRAN122
C               NITER   = NUMBER OF ITERATIONS IN ROUTING SCHEME          TRAN123
C                                                                         TRAN124
      READ(5,500)DT,EPSIL,DWDAYS                                          TRAN125
C                                                                         TRAN126
C               DT      = LENGTH OF TIME STEP IN SECONDS                  TRAN127
C               EPSIL   = CONVERGENCE CRITERIA IN ROUTING                 TRAN128
C               DWDAYS  = NUMBER OF DRY WEATHER DAYS PRIOR TO STORM       TRAN129
C                                                                         TRAN130
C     ASSIGN DEFAULT VALUES                                               TRAN131
      IF(NITER.LE.0) NITER=4                                              TRAN132
      IF (EPSIL.LE.0.0) EPSIL = 0.0001                                    TRAN133
C                                                                         TRAN134
      READ(5,901) NCNTRL,NINFIL,NFILTH,JPRINT,JPLOT                       TRAN135
C                                                                         TRAN136
C               NCNTRL = 1 IF INPUT INFORMATION IS ON TAPE                TRAN137
C                        0 IF INPUT INFORMATION IS NOT ON TAPE            TRAN138
C               NINFIL = 1 IF INFILTRATION ROUTINE IS TO BE CALLED        TRAN139
C                        0 IF INFITRATION ROUTINE IS NOT TO BE CALLED     TRAN140
C               NFILTH = 1 IF DRY WEATHER FLOW ROUTINE IS TO BE CALLED    TRAN141
C                        0 IF DRY WEATHER FLOW ROUTINE IS NOT TO BE CALLEDTRAN142
C               JPRINT = 1 IF PRINTING ROUTINE IS TO BE CALLED            TRAN143
C                        0 IF PRINTING ROUTINE IS NOT TO BE CALLED        TRAN144
C               JPLOT  = 1 IF PLOTTING ROUTINE IS TO BE CALLED FROM WITHINTRAN145
C                        0 IF PLOTTING ROUTINE NOT CALLED FROM WITHIN     TRAN146
C                                                                         TRAN147
C     READ IN ELEMENT DATA AND INITIALIZE VARIABLES.                      TRAN148
C                                                                         TRAN149
      I = 1                                                               TRAN150
        KSTOR = 0                                                         TRAN151
        NSTOR = 0                                                         TRAN152
      ICOST(1)=0                                                          TRAN152A
      ICOST(2)=0                                                          TRAN152B
      DO 47 K=1,NE                                                        TRAN153
      READ(5,902)NOE(K),(NUE(K,J),J=1,3),NTYPE(K),DIST(K),GEOM1(K),SLOPETRAN154
     1(K),ROUGH(K),GEOM2(K),BARREL(K),GEOM3(K)                            TRAN155
C                                                                         TRAN156
C     ASSIGN DEFAULT VALUES                                               TRAN157
C                                                                         TRAN158
      IF(BARREL(K).LT.1.0) BARREL(K)=1.0                                  TRAN159
      IF(GEOM1(K).LE.0.0) GEOM1(K)=0.0                                    TRAN160
      IF (NTYPE(K).LE.15.AND.SLOPE(K).LE.0.0) SLOPE(K)=0.1                TRAN161X
      IF(ROUGH(K).LE.0.0.AND.NTYPE(K).LE.15)  ROUGH(K)=0.0130             TRAN162
C     ASSUME MANHOLE IF TYPE NOT SPECIFIED                                TRAN163X
      IF(NTYPE(K).LE.0) NTYPE(K)=16                                       TRAN164X
C                                                                         TRAN165
        KSTORE(K) = 0                                                     TRAN166
      IF(NTYPE(K) .NE. 19) GO TO 54                                       TRAN167
        KSTOR     = KSTOR + 1                                           TRAN168
        KSTORE(K) = KSTOR                                                 TRAN169
        NSTOR     = KSTOR                                               TRAN170
   54 CONTINUE                                                            TRAN171
      QFULL(K) = 0.0                                                      TRAN172
      QMAX(K)=0.0                                                         TRAN173
      AFULL(K)=0.0                                                        TRAN174
      NNEED = NOE(K)                                                      TRAN175
   47 NIN(NNEED) = K                                                      TRAN176
C                                                                         TRAN177
```

```
C*********READ DATA FOR STORAGE ELEMENTS                                    TRAN178
C                                                                          TRAN179
      IF (NSTOR .GT. 2)  GO TO 9000                                        TRAN180
      IF (NSTOR .GT. 0)  CALL TSTRDT                                       TRAN181
C                                                                          TRAN182
C*********SEQUENCE ELEMENT DATA                                            TRAN183
C                                                                          TRAN184
      WRITE(6,903)(TITLE(I),I=1,20)                                        TRAN185
      CALL SLOP                                                            TRAN186
C                                                                          TRAN187
C*********CALCULATE CONSTANTS AND FLOW PARAMETERS FOR EACH ELEMENT         TRAN188
C                                                                          TRAN189
      CALL FIRST                                                           TRAN190
C                                                                          TRAN191
C*********WRITE DESCRIPTION OF RUN AND SEWER SYSTEM                        TRAN192
C                                                                          TRAN193
      WRITE (6,903) (TITLE(I),I=1,20)                                      TRAN194
      WRITE(6,915)NE,NDT,DT                                                TRAN195
      WRITE (6,916)                                                        TRAN196
      DO 48 I=1,NE                                                         TRAN197
      NT = NTYPE(I)                                                        TRAN198
   48 WRITE (6,920) NOE(I),NT,(NAME(J,NT),J=1,4),SLOPE(I),DIST(I),         TRAN199
     1ROUGH(I),GEOM1(I),GEOM2(I),GEOM3(I),BARREL(I),AFULL(I),QFULL(I),     TRAN200
     2QMAX(I),SCF(I)                                                       TRAN201
      WRITE(6,913) EPSIL,NITER                                             TRAN202
C                                                                          TRAN203
C*********INITIALIZATION                                                   TRAN204
C                                                                          TRAN205
      NEE=NE+1                                                             TRAN206
      DO 50 K=1,NEE                                                        TRAN207
      IOLD(K)=1                                                            TRAN208
      QINFIL(K)=0.0                                                        TRAN209
      QDWF(K)=0.0                                                          TRAN210
      SCOUR(K)=0.0                                                         TRAN211
      IR(K)=NINPUT+1                                                       TRAN212
      DO 50 L=1,NPOLL                                                      TRAN213
      WDWF(K,L)=0.0                                                        TRAN214
   49 PLUTO(K,L)=0.0                                                       TRAN215
      DO 50 I=1,2                                                          TRAN216
      DO 50 II=1,2                                                         TRAN217
      CPOLL(K,I,II,L)=0.0                                                  TRAN218
      A(K,II,I)=0.0                                                        TRAN219
   50 Q(K,II,I)=0.0                                                        TRAN220
      CO(NE+1)=0.0                                                         TRAN221
      QI(NE+1)=0.0                                                         TRAN222
      NTYPE(NE+1)=16                                                       TRAN223
      NPOLS=NPOLL+1                                                        TRAN224
      KDAY=1                                                               TRAN225
      KHOUR=1                                                              TRAN226
      KMINS=0                                                              TRAN227
      TIME=0.0                                                             TRAN228
      RNOFF(NINPUT+1)=0.0                                                  TRAN229
      DO 51 I=1,NPOLL                                                      TRAN230
      PLUTO(NINPUT+1,I)=0.0                                                TRAN231
   51 CPOLL(NE+1,2,2,I)=0.0                                                TRAN232
      DO 52 I=1,7                                                          TRAN233
      DVDWF(I)=1.0                                                         TRAN234
      DVBOD(I)=1.0                                                         TRAN235
   52 DVSS(I)=1.0                                                          TRAN236
      DO 53 I=1,24                                                         TRAN237
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      HVDWF(I)=1.0                                                      TRAN238
      HVBOD(I)=1.0                                                      TRAN239
   53 HVSS(I)=1.0                                                       TRAN240
C                                                                       TRAN241
C********INTERFACING MECHANISM FOR QUANTITY AND QUALITY OF RUNOFF      TRAN242
C                                                                       TRAN243
      INCNT=INCNT+1                                                     TRAN244
      IOUTCT=IOUTCT+1                                                   TRAN245
      NTRIN=JIN(INCNT)                                                  TRAN246
      NTROUT=JOUT(IOUTCT)                                               TRAN247
C     BYPASS TAPE OPERATIONS IF DESIRED                                 TRAN248
      IF(NCNTRL.NE.1) GO TO 59                                          TRAN249
C                                                                       TRAN250
C********READ HEADING INFORMATION ON INPUT TAPE                        TRAN251
C                                                                       TRAN252
      REWIND NTRIN                                                      TRAN253
      READ(NTRIN)(TITLE(I),I=1,40)                                      TRAN254
      READ(NTRIN) NDUM1,NINPUT,NPOLL,NDUM2,TZERO,TAREA                  TRAN255X
C                                                                       TRAN256
C     READ ELEMENT NOS. AT WHICH HYDROGRAPHS AND POLLUTOGRAPHS ARE      TRAN257
C     ENTERED. THIS MUST ALSO BE THE ORDER IN WHICH HYDROGRAPH AND      TRAN258
C     POLLUTOGRAPH ORDINATES APPEAR AT EACH TIME STEP.                  TRAN259
C                                                                       TRAN260
      READ(NTRIN) (NORDER(I),I=1,NINPUT)                                TRAN261
C                                                                       TRAN262
C********WRITE HEADING INFORMATION ON OUTPUT TAPE                      TRAN263
C                                                                       TRAN264
   59 CONTINUE                                                          TRAN265
      REWIND NTROUT                                                     TRAN265A
      WRITE(NTROUT)(TITLE(I),I=1,40)                                    TRAN266
      WRITE(NTROUT) NDT,NOUTS,NPOLL,DT,TZERO,TAREA                      TRAN267X
C                                                                       TRAN268
C********READ ELEMENT NUMBERS FOR WHICH OUTPUT IS TO BE PROVIDED ON TAPETRAN269
C                                                                       TRAN270
      READ(5,901)(JN(I),I=1,NOUTS)                                      TRAN271
      WRITE(6,917) (JN(I),I=1,NOUTS)                                    TRAN272
      WRITE(NTROUT)(JN(N),N=1,NOUTS)                                    TRAN273
C                                                                       TRAN274
      DO 60 I=1,NINPUT                                                  TRAN275
      NNEED=NORDER(I)                                                   TRAN276
      NNEED=NIN(NNEED)                                                  TRAN277
   60 IR(NNEED)= I                                                      TRAN278
C                                                                       TRAN279
C********PERFORM SCRATCH TAPE OPERATIONS                               TRAN280
C                                                                       TRAN281
C     READ IN ELEMENT NUMBERS FOR WHICH INPUT POLLUTOGRAPHS AND         TRAN282
C     HYDROGRAPHS TO BE STORED AT ALL TIME STEPS.                       TRAN283
C                                                                       TRAN284
      READ(5,901)(NYN(I),I=1,NNYN)                                      TRAN285
C                                                                       TRAN286
C     READ IN ELEMENT NUMBERS FOR WHICH OUTPUT POLLUTOGRAPHS AND        TRAN287
C     HYDROGRAPHS TO BE STORED AT ALL TIME STEPS.                       TRAN288
C                                                                       TRAN289
      READ(5,901)(NPE(I),I=1,NNPE)                                      TRAN290
C                                                                       TRAN291
C********STORE PRINT INFORMATION ON SCRATCH TAPES                       TRAN292
C                                                                       TRAN293
      DO 62 III=1,2                                                     TRAN294
      NTX=NSCRAT(III)                                                   TRAN295
      REWIND NTX                                                        TRAN296
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```
      IF(III.GT.1) GO TO 61                                              TRAN297
      WRITE(NTX) NDT,NNYN,NPOLL,NNPE,DT,JPRINT,JPLOT                     TRAN298
      WRITE(NTX) (NYN(I),I=1,NNYN)                                       TRAN299
      GO TO 62                                                           TRAN300
   61 WRITE(NTX) NDT,NNPE,NPOLL,NNPE,DT,JPRINT,JPLOT                     TRAN301
      WRITE(NTX) (NPE(I),I=1,NNPE)                                       TRAN302
   62 CONTINUE                                                           TRAN303
C                                                                        TRAN304
C********DETERMINE AVERAGE DAILY DWF AND INFILTRATION                    TRAN305
C                                                                        TRAN306
C     DATA IS READ FROM BOTH OF THESE SUBROUTINES                        TRAN307
      IF(NINFIL.EQ.1) CALL INFIL                                         TRAN308
C                                                                        TRAN309
      IF(NFILTH.EQ.1) CALL FILTH                                         TRAN310
C                                                                        TRAN311
C********INITIALIZE FLOWS, AREAS, CONCENTRATIONS AND DEPOSITION          TRAN312
C                                                                        TRAN313
      N = 0                                                              TRAN314
      CALL DWLOAD(DWDAYS)                                                TRAN315
C                                                                        TRAN316
      CALL INITAL                                                        TRAN317
C                                                                        TRAN318
C********BEGIN MAIN LOOPS OF PROGRAM                                     TRAN319
C********OUTER LOOP ON TIME, INNER LOOP ON ELEMENT NUMBER                TRAN320
C                                                                        TRAN321
      DO 200 N=1,NDT                                                     TRAN322
C     UPDATE TIME OF DAY                                                 TRAN323
      TIME=TIME+DT                                                       TRAN324
      KMINS=KMINS+INT(DT)/60                                             TRAN325
      IF(KMINS.GT.60) KHOUR=KHOUR+1                                      TRAN326
      IF(KMINS.GT.60) KMINS=KMINS-60                                     TRAN327
      IF(KHOUR.GT.24) KDAY=KDAY+1                                        TRAN328
      IF(KHOUR.GT.24) KHOUR=1                                            TRAN329
      IF(KDAY.GT.7) KDAY=1                                               TRAN330
C                                                                        TRAN331
C********READ INPUT TAPE AT EACH TIMESTEP                                TRAN332
C                                                                        TRAN333
      IF(NCNTRL.NE.1) GO TO 63                                           TRAN334
C     READ INPUT HYDROGRAPH AND POLLUTOGRAPH ORDINATES AT EACH TIME STEP TRAN335
C                                                                        TRAN336
      READ(NTRIN) DTIN,(RNOFF(I),I=1,NINPUT),((PLUTO(I,J),J=1,NPOLL),   TRAN337
     1I=1,NINPUT)                                                        TRAN338
C                                                                        TRAN339
   63 CONTINUE                                                           TRAN340
C                                                                        TRAN341
C********CONVERT INFLOW POLLUTOGRAPHS TO LBS/SEC OR MPN/SEC             TRAN342
C                                                                        TRAN343
      DO 68 ND=1,NINPUT                                                  TRAN344
      DO 68 NJ=1,NPOLL                                                   TRAN345
   68 PLUTO(ND,NJ)=PLUTO(ND,NJ)/60.                                      TRAN346
C                                                                        TRAN347
C********BEGIN INNER LOOP ON ELEMENT NUMBER                              TRAN348
C                                                                        TRAN349
      DO 150 I=1,NE                                                      TRAN350
C     M=CURRENT ELEMENT NUMBER,(INTERNAL NUMBER).                        TRAN351
      M=JR(I)                                                            TRAN352
C                                                                        TRAN353
C     STORE INPUT HYDROGRAPHS AND POLLUTOGRAPHS FOR DESIRED ELEMENTS     TRAN354
C                                                                        TRAN355
      DO 70 J=1,NNYN                                                     TRAN356
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```
      IF(NOE(M)-NYN(J)) 70,69,70                                          TRAN357
   69 NNEED=IR(M)                                                         TRAN358
      OUTIN(J,1) = RNOFF(NNEED)                                           TRAN359
      DO 81 JJ=2,NPOLS                                                    TRAN360
C     CONVERT INLET POLLUTOGRAPH TO LBS/MIN OR MPN/MIN FOR PRINT ONLY     TRAN361
   81 OUTIN(J,JJ)= PLUTO(NNEED,JJ-1) * 60.                                TRAN362
      GO TO 71                                                            TRAN363
   70 CONTINUE                                                            TRAN364
C                                                                         TRAN365
   71 INPUT=M                                                             TRAN366
C                                                                         TRAN367
C********CORRECT DWF FOR TEMPORAL VARIATIONS                             TRAN368
C                                                                         TRAN369
C     CORRECT SEWAGE FOR DAILY VARIATION                                  TRAN370
C     WDWF(INPUT,1) IS B O D IN LBS/SEC                                   TRAN371
C     WDWF(INPUT,2) IS SS IN LBS/SEC                                      TRAN372
C     WDWF(INPUT,3) IS COLIFORM IN MPN/SEC                                TRAN373
      CDWF=QDWF(INPUT)*DVDWF(KDAY)                                        TRAN374
      WDWF1=WDWF(INPUT,1)*DVBOD(KDAY)*DVDWF(KDAY)                         TRAN375
      WDWF2=WDWF(INPUT,2)*DVSS(KDAY)*DVDWF(KDAY)                          TRAN376
      WDWF3=WDWF(INPUT,3)*1.0*DVDWF(KDAY)                                 TRAN377
C     CORRECT SEWAGE FOR HOURLY VARIATION                                 TRAN378
      DUMY1=CDWF*HVDWF(KHOUR)                                             TRAN379
      DUMY2=WDWF1*HVBOD(KHOUR)*HVDWF(KHOUR)                               TRAN380
      DUMY3=WDWF2*HVSS(KHOUR)*HVDWF(KHOUR)                                TRAN381
      DUMY5=WDWF3*HVCOLI(KHOUR)*HVDWF(KHOUR)                              TRAN382
C                                                                         TRAN383
C********SUM UPSTREAM FLOWS                                              TRAN384
C                                                                         TRAN385
      TOTAL=0.0                                                           TRAN386
      DO 80 J=1,3                                                         TRAN387
      NNEED=INUE(M,J)                                                     TRAN388
      NTU = NTYPE(NNEED)                                                  TRAN389
      IF (NTU.LE.17.OR.NTU.GE.23) GO TO 79                                TRAN390
C     HERE IF UPSTREAM ELEMENT IS OF FLOW DIVIDER TYPE.                   TRAN391
      L = GEOM3(NNEED)                                                    TRAN392
      QQ = QC2(NNEED)                                                     TRAN393
      IF (NOE(M).EQ.L) QQ = QQ1(NNEED)                                    TRAN394
      TOTAL = TOTAL+QQ                                                    TRAN395
      GO TO 80                                                            TRAN396
   79 TOTAL = TOTAL+QQ(NNEED)                                             TRAN397
   80 CONTINUE                                                            TRAN398
C                                                                         TRAN399
C********SURCHARGE ROUTINE                                               TRAN400
C                                                                         TRAN401
      KFULL=2                                                             TRAN402
      NT = NTYPE(M)                                                       TRAN403
      K = KLASS(NT)                                                       TRAN404
      GO TO (90,90,110),K                                                 TRAN405
C     IF ELEMENT IS A CONDUIT,CHECK FOR SURCHARGING.                      TRAN406
   90 QI(M) = TOTAL/BARREL(M)                                             TRAN407
      QI(M)=QI(M)+QINFIL(M)                                               TRAN407A
      IF(QI(M).LE.QMAX(M)) GO TO 95                                       TRAN408
C     STORE SURCHARGE IN UPSTREAM ELEMENT.                                TRAN409
C     SURCHARGING CONDUIT IS ASSUMED TO HAVE MANHOLE AT UPSTREAM END.     TRAN410
C     ASSUME ELEMENT WILL FLOW FULL AT UPSTREAM END.                      TRAN411
      QFULL(M) = P1(M)*SQRT(SLOPE(M))                                     TRAN412
      NNEED=INUE(M,1)                                                     TRAN413
      SURGE2(NNEED) = (QI(M)-QFULL(M))*DT*BARREL(M)                       TRAN414
      WRITE (6,960) TIME,N,NOE(M),SURGE2(NNEED),NUE(M,1)                  TRAN415
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```
      QI(M)=CFULL(M)                                                    TRAN416
      KFULL=  1                                                         TRAN417
      ITER = 0                                                          TRAN418
      GO TO 115                                                         TRAN419
C     NO LONGER UPSTREAM SURCHARGE.                                     TRAN420
   95 NNEED=INUE(M,1)                                                   TRAN421
      SURGE2(NNEED)=0.0                                                 TRAN422
      ITER=NITER                                                        TRAN423
      GO TO 115                                                         TRAN424
C                                                                       TRAN425
C********SUM INFLOWS TO NON-CONDUITS.                                  TRAN426
C                                                                       TRAN427
  110 NNEED = IR(M)                                                     TRAN428
      QI(M)=TOTAL+RNOFF(NNEED)+SURGE2(M)/DT+DUMY1                       TRAN429
      IF(QI(M).LT.0.0) QI(M)=0.0                                        TRAN430
      ITER = 0                                                          TRAN431
C                                                                       TRAN432
C********ROUTE FLOW THROUGH ELEMENT                                    TRAN433
C                                                                       TRAN434
  115 CALL ROUTE(NITER)                                                 TRAN435
      IF(NT.EQ.19) GO TO 116                                            TRAN436
      ITER = ITER+1                                                     TRAN437
      IF(ITER.GT.NITER) GO TO 115                                       TRAN438
C                                                                       TRAN439
C********MULTIPLY FLOW BY NUMBER OF BARRELS                            TRAN440
C                                                                       TRAN441
  116 QI(M) = CI(M)*BARREL(M)                                           TRAN442
      QO(M) = CO(M)*BARREL(M)                                           TRAN443
      IF (NT.EQ.19) GO TO 6600                                          TRAN444
C     IF(M.NE.115) GO TO 1010                                           KINGTEMP
C     RATIO=A(M,2,2)/AFULL(M)                                           KINGTEMP
C     FLODEP(M)=DEPTH(RATIO)*GEOM1(M)                                   KINGTEMP
C1010 CONTINUE                                                          KINGTEMP
C                                                                       TRAN445
C********ROUTE QUALITY PARAMETERS THROUGH ELEMENT                      TRAN446
C                                                                       TRAN447
      CALL QUAL(DUMY2,DUMY3,0.0,DUMY5)                                  TRAN448
C                                                                       TRAN449
C********STORE DESIRED OUTFLOWS TO BE GENERATED ONTO OUTPUT TAPE       TRAN450
C                                                                       TRAN451
 6600 DO 6666 J=1,NOUTS                                                 TRAN452
      IF(NOE(M)-JN(J)) 6666,6610,6666                                   TRAN453
 6610 OUTTAP(J,1)=QO(M)                                                 TRAN454
      DO 6620 JJ=2,NPOLS                                                TRAN455
C     CONVERT POLLUTOGRAPHS TO LBS/MIN OR MPN/MIN FOR INTERFACING       TRAN456
 6620 OUTTAP(J,JJ)=CPOLL(M,2,2,JJ-1) * QO(M)*60.                        TRAN457
      GO TO 117                                                         TRAN458
 6666 CONTINUE                                                          TRAN459
C                                                                       TRAN460
C********STORE DESIRED OUTFLOWS TO BE GENERATED ON SCRATCH TAPE        TRAN461
C         FOR PRINTING PURPOSES                                         TRAN462
C                                                                       TRAN463
  117 DO 124 J=1,NNPE                                                   TRAN464
      IF(NOE(M)-NPE(J))124,120,124                                      TRAN465
  120 OUT(J,1) = QO(M)                                                  TRAN466
      DO 118 JJ=2,NPOLS                                                 TRAN467
C     CONVERT OUTFLOW POLLUTOGRAPH TO LBS/MIN OR MPN/MIN FOR PRINT ONLY TRAN468
  118 OUT(J,JJ) = CPOLL(M,2,2,JJ-1) * QO(M) * 60.                       TRAN469
      GO TO 125                                                         TRAN470
  124 CONTINUE                                                          TRAN471
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C
C********REPLACE VALUES AT OLD TIME STEP BY VALUES AT NEW ONE                TRAN472
C                                                                           TRAN473
  125 A(M,1,1)=A(M,1,2)                                                     TRAN474
      A(M,2,1)=A(M,2,2)                                                     TRAN475
      DO 126 IP=1,NPOLL                                                     TRAN476
      CPOLL(M,1,1,IP)=CPOLL(M,1,2,IP)                                       TRAN477
  126 CPOLL(M,2,1,IP)=CPOLL(M,2,2,IP)                                       TRAN478
      Q(M,1,1)=Q(M,1,2)/BARREL(M)                                           TRAN479
  150 Q(M,2,1)=Q(M,2,2)/BARREL(M)                                           TRAN480
C                                                                           TRAN481
C********STORE DESIRED INPUT HYDROGRAPHS AND POLLUTOGRAPHS ON SCRATCH       TRAN482
C         TAPE.                                                             TRAN483
      NTX=NSCRAT(1)                                                         TRAN484
      DO 140 I=1,NNYN                                                       TRAN485
  140 WRITE(NTX) (QUTIN(I,J),J=1,NPOLS)                                     TRAN486
C                                                                           TRAN487
C********STORE DESIRED OUTPUT HYROGRAPHS AND POLLUTOGRAPHS ON SCRATCH       TRAN488
C         TAPE.                                                             TRAN489
      NTX=NSCRAT(2)                                                         TRAN490
      DO 155 I=1,NNPE                                                       TRAN491
  155 WRITE(NTX) (OUT(I,J),J=1,NPOLS)                                       TRAN492
C                                                                           TRAN493
C********GENERATE OUTPUT TAPE TO BE USED BY INTERFACING MODEL               TRAN494
C                                                                           TRAN495
      TIMX=TIME+TZERO                                                       TRAN495
      WRITE(NTROUT) TIMX, (OUTTAP(J,1),J=1,NOUTS),((OUTTAP(J,KK),KK=2,NPTRAN497T
     *OLS),J=1,NOUTS)                                                       TRAN497T
C                                                                           TRAN498
      IF(NPRINT.LT.2) GO TO 200                                             TRAN499
      WRITE (6,980)                                                         TRAN500
      WRITE (6,981) TIME,(QFULL(J),J=1,NE)                                  TRAN501
  200 CONTINUE                                                              TRAN502
C                                                                           TRAN503
C********PRINT FINAL SOLIDS DEPOSITION                                      TRAN504
C                                                                           TRAN505
      WRITE(6,940)                                                          TRAN506
      WRITE(6,942)                                                          TRAN507
      DO 333 I=1,NE                                                         TRAN508
      M=JR(I)                                                               TRAN509
      NT=NTYPE(M)                                                           TRAN510
      IF(KLASS(NT).GT.2) GO TO 333                                          TRAN511
      WRITE(6,944) NUE(M),SCCUR(M)                                          TRAN512
  333 CONTINUE                                                              TRAN513
C  THE FOLLOWING WRITE STATEMENTS ARE TO WRITE THE FLOW DEPTH FOR           TRAN514
C  ELEMENT 115 OF KINGMAN LAKE AREA.                                        KINGTEMP
C     WRITE(06,1000)                                                        KINGTEMP
C1000 FORMAT('1','DEPTH OF FLOW FOR ELEMENT 115 (DOWNSTREAM) FOR EACH TIKINGTEMP
C    *MESTEP'//' ','STEP     1         2         3         4         5    KINGTEMP
C    *       6         7         8         9         10'//)              KINGTEMP
C     WRITE(C6,1001)(FLODEP(I),I=1,NDT)                                     KINGTEMP
C1001 FORMAT(' ',10F10.1)                                                   KINGTEMP
C     WRITE(C6,1CC2)                                                        KINGTEMP
C1002 FORMAT('1')                                                           KINGTEMP
C                                                                           KINGTEMP
C********PRINT HEADINGS                                                    TRAN515
C                                                                           TRAN516
      WRITE(6,903)(TITLE(I),I=1,20)                                         TRAN517
      WRITE(6,910)TIME,DT                                                   TRAN518
      WRITE(6,925) (NORDER(I),I=1,NINPUT)                                   TRAN519
                                                                            TRAN520
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C                                                                       TRAN521
C********PRINT TOTAL HYDROGRAPHS AND POLLUTOGRAPHS FOR DESIRED ELEMENTS TRAN522
C                                                                       TRAN523
      IF(JPRINT.NE.1) GO TO 170                                         TRAN524
      CALL PRINT                                                        TRAN525
C                                                                       TRAN526
  170 CONTINUE                                                          TRAN527
C                                                                       TRAN528
      CALL TSTCST                                                       TRAN529
      GO TO 9999                                                        TRAN530
C-------------------ERROR MESSAGES--------------------------------     TRAN531
 9000 WRITE(6,690) NSTOR                                                TRAN532
  690 FORMAT('0 *** THE NUMBER OF STORAGE UNITS,  NSTOR =', I5,         TRAN533
     *       ', MUST NOT EXCEED  2')                                    TRAN534
 9999 RETURN                                                            TRAN535
C                                                                       TRAN536
C********FORMAT STATEMENTS                                             TRAN537
C                                                                       TRAN538
  900 FORMAT(8F10.5)                                                    TRAN539
  901 FORMAT(16I5)                                                      TRAN540
  902 FORMAT(5I4,7F8.3)                                                 TRAN541
  903 FORMAT(20A4)                                                      TRAN542
  91C FORMAT (' TOTAL SIMULATION TIME='F7.1,' SECONDS. TIME STEP='F6.1, TRAN543
     1 ' SECONDS.')                                                     TRAN544
  911 FORMAT(' EXTERNAL'/' ELEMENT    TIME STEP'/' NUMBER',3X,10(I6,4X))TRAN545
  912 FORMAT (/I6,4X,10F10.3,/,(10X,10F10.3))                           TRAN546
  913 FORMAT (///'  EPSILON='F8.6,5X,'NO. OF ITERATIONS IN ROUTING ROUTITRAN547
     1NE =',I5)                                                         TRAN548
  915 FORMAT(T10,'NUMBER OF ELEMENTS=',I5,/T10,'NUMBER OF TIME INT=',   TRAN549
     1I5/15X,'TIME INTERVAL='F7.1,' SECONDS.')                          TRAN550
  916 FORMAT ('0ELEMENT PARAMETERS'/'  EXT. TYPE  DESCRIPTION'7X,'SLOPE TRAN551
     1 DISTANCE  MANNING    GEOM1  GEOM2  GEOM3  NUMBER   AFULL   QFULL TRAN552
     2   QMAX    SUPER-CRITICAL'/'  ELE.'24X,'(FT/FT)   (FT)    ROUGHNESTRAN553
     3S   (FT)   (FT)   (FT)    OF    (SQ.FT)  (CFS)    (CFS)   FLOW WHETRAN554
     4N LESS'/'  NUM.'74X,'BARRELS'27X,'THAN 95% FULL?')                TRAN555
  917 FORMAT ('0HYDROGRAPHS AND POLLUTOGRAPHS PROVIDED TO SUBSEQUENT PROTRAN556
     1GRAMS FOR THE FOLLOWING ELEMENTS:'/(10I5))                        TRAN557
  92C FORMAT (2I5,3X,4A4,F8.5,F9.2,F9.4,F9.3,2F7.3,F6.1,3F9.3,5X,A4)    TRAN558
  921 FORMAT(//43X,'SELECTED INLET HYDROGRAPHS - CFS')                  TRAN559
  922 FORMAT(//43X,'SELECTED INLET POLLUTOGRAPHS - LBS/DT  ')           TRAN560
  923 FORMAT(//42X,'SELECTED OUTFLOW HYDROGRAPHS - CFS')                TRAN561
  924 FORMAT(//42X,'SELECTED OUTFLOW POLLUTOGRAPHS - LBS/DT  ')         TRAN562
  925 FORMAT(///' INFLOW POLLUTOGRAPHS AND HYDROGRAPHS AT THE FOLLOWING TRAN563
     1EXTERNAL ELEMENT NUMBERS:'/(20I5))                                TRAN564
  926 FORMAT (//40X,'OVERFLOWS FROM OVERFLOW STRUCTURES')               TRAN565
  940 FORMAT('1',30X,'BED OF SOLIDS IN SEWER AT END OF STORM'///)       TRAN566
  942 FORMAT(' ',31X,'ELEMENT',20X,'SOLIDS IN',/,32X,'NUMBER',23X,'BOTTOTRAN567
     1M'/,62X,'(LBS)'///)                                               TRAN568
  944 FORMAT(' ',30X,I6,20X,F10.5)                                      TRAN569
  950 FORMAT(16F5.2)                                                    TRAN570
  955 FORMAT('C',40X,'POLLUTANT',I5)                                    TRAN571
  960 FORMAT ('0TIME='F7.0,' SECONDS, TIME STEP='I5,'. ELEMENT'I4,' SURCTRAN572
     1HARGING. SURCHARGE OF',F11.2, 'CU. FT. STORED AT UPSTREAM ELEMENT'TRAN573
     2 I4)                                                              TRAN574
  970 FORMAT ('0NTYPE  DESCRIPTION      ALFMAX  PSIMAX  AFACT   RFACT  KTRAN575
     1DEPTH 'KLASS  INDEX  ANORM   QNORM    DNORM')                    TRAN576
  971 FORMAT (I4,4X,4A4,F7.4,3F8.4,I5,I7,I9,F8.3,2F9.5,/(67X,I8,F8.3,   TRAN577
     1 2F9.5))                                                          TRAN578
  972 FORMAT ('0 NON-CONDUITS'//'    NTYPE  KDEPTH  KLASS  DESCRIPTION')TRAN579
  973 FORMAT('C',I6,I7,I8,4X,4A4)                                       TRAN580
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980 FORMAT ('    TIME    QFULLS FROM ELEMENT 1 TO NE.')                    TRAN581
981 FORMAT (F9.0,15F8.2/(9X,15F8.2))                                      TRAN582X
983 FORMAT(//43X,'SELECTD VELOCITIES - FT./SEC.')                         TRAN583
    END                                                                   TRAN584
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```
      FUNCTION DEPTH(ALPHA)                                                  DEPT  1
C     COMPUTES NORMALIZED DEPTH IN CONDUIT GIVEN NORMALIZED AREA, ALPHA.     DEPT  2
      DIMENSION QI(160),QO(160)                                              DEPT  3
      COMMON/TABLES/KDEPTH(25),KLASS(25),PSIMAX(15),ALFMAX(15),              DEPT  4
     1              NN(25),MM(25),ANORM(15,51),QNORM(15,51),                DEPT  5
     2              DNORM(15,51),AFACT(15),RFACT(15)                        DEPT  6
      COMMON A(160,2,2) ,Q(160,2,2) , CPOLL(160,2,2,3), QMAX(160),           DEPT  7
     1       QFULL(160), AFULL(160), DXDT(160),C1(160), SLOPE(160),          DEPT  8
     2       CIST(160), GEOM1(160), ROUGH(160), NOE(160), NUE(160,3),        DEPT  9
     3       INUE(160,3), NTYPE(160), JR(160), NKLASS, NE, NDT, EPSIL,       DEPT 10
     4       TIME, DT, M, KFULL, N, NOS, NPOLL, NPRINT, ITER,                DEPT 11
     5       CDWF(160), IOLD(160), P1(160), RNOFF(160), QINFIL(160),         DEPT 12
     6       WDWF(160,3), PLUTO(160,3), IR(160), P2(160), NIN(1000),         DEPT 13
     7       P5(160),P6(160),P7(160),SCF(160),BARREL(160),                   DEPT 14
     8       TITLE(40), NPE(20), NYN(20), NORDER(70), GEOM2(160),            DEPT 15
     9       GEOM3(160) , P4(160),SCOUR(160), KSTORE(160)                    DEPT 16
      COMMON  BCDIN( 2,150),SSIN( 2,150),BODOUT,SSOUT,COLIN(2,150),          DEPT 17X
     *  QINST,COUST,QINSTL( 2),COUSTL( 2),STORL( 2),QOUTO( 2),STORO( 2),     DEPT 18
     *  NSTOR,KSTOR,IPRINT( 2),IPOL( 2),IFLOOD( 2),ICOST( 2),DEPMAX( 2),     DEPT 19
     *  ATERM( 2,11),AO2DT2( 2,11),BDEPTH( 2,11),BSTOR( 2,11),COLOUT,       DEPT 20X
     *  DUMSTR(11),DUMDEP(11),                                               DEPT 21
     *  KTSTEP,VCLIN( 2,150),VOLOUT( 2,150),STOR,CUMIN( 2),CUMOUT( 2),       DEPT 22
     *  SBOD( 2),SSS( 2),SCOL( 2),                                           DEPT 23X
     *  ISTMOD( 2),ISTTYP( 2),ISTOUT( 2),                                    DEPT 24
     *  QPUMP( 2),DSTART( 2),DSTOP( 2),                                      DEPT 25
     *  DTON( 2),STORMX( 2),DTPUMP( 2),DTMORE( 2),STORF( 2),APLAN( 2),       DEPT 26
     *  CLAND( 2),CSTOR( 2),CPS( 2),CTOTAL( 2),CPCUYD( 2),CPACRE( 2),        DEPT 27
     *  LP,JP,LPREV( 2),LABEL,DETENT(150),FRAC(150),OUT1(10,200)             DEPT 28X
      EQUIVALENCE (QO(1),Q(1,2,2)),(QI(1),Q(1,1,2))                          DEPT 29
      IF(ALPHA.EQ.0.0) GO TO 80                                              DEPT 30
      NT = NTYPE(M)                                                          DEPT 31
C     KDEPTH(NT) = 1 FOR CONDUIT WITH A FUNCTIONAL D-A RELATIONSHIP.         DEPT 32
C     KDEPTH(NT) = 2 FOR CONDUIT WITH A TABULAR D-A RELATIONSHIP.            DEPT 33
C     KDEPTH(NT) = 3 FOR ELEMENT OTHER THAN CONDUIT.                         DEPT 34
      IF (KDEPTH(NT).EQ.2) GO TO 50                                          DEPT 35
      IF (NT.EQ.2) GO TO 80                                                  DEPT 36
      IF (NT.EQ.10) GO TO 100                                                DEPT 37
      IF (NT.EQ.11) GO TO 110                                                DEPT 38
      IF (NT.EQ.12) GO TO 120                                                DEPT 39
C     ROUTINE FOR TABULAR D-A CURVE.                                         DEPT 40
C     LINEAR  INTRPOLATION BETWEEN TABULAR POINTS IS USED.                   DEPT 41
   50 DALPHA = ANORM(NT,2)-ANORM(NT,1)                                       DEPT 42
      I = ALPHA/DALPHA+1.0                                                   DEPT 43
      DEPTH = DNORM(NT,I)+(ALPHA-ANORM(NT,I))/DALPHA*(DNORM(NT,I+1)-         DEPT 44
     1 DNORM(NT,I))                                                          DEPT 45
      RETURN                                                                 DEPT 46
C     IN RECTANGULAR CONDUIT, NORMALIZED DEPTH EQUALS NORMALIZED AREA.       DEPT 47
   80 DEPTH = ALPHA                                                          DEPT 48
      RETURN                                                                 DEPT 49
C     FUNCTIONAL FORM FOR MODIFIED BASKET-HANDLE.                            DEPT 50
  100 AA = ALPHA*AFULL(M)                                                    DEPT 51
      IF (AA.GT.GEOM3(M)) GO TO 105                                          DEPT 52
      DEPTH = AA/GEOM2(M)/(GEOM1(M)+GEOM2(M)/2.0)                            DEPT 53
      RETURN                                                                 DEPT 54
  105 ALF = (AA-GEOM3(M)+P5(M)/2.0)/P5(M)                                    DEPT 55
      I = ALF/0.02+1.0                                                       DEPT 56
      DD = DNORM(1,I)+(ALF-ANORM(1,I))/0.02*(DNORM(1,I+1)-DNORM(1,I))        DEPT 57
      DEPTH = ((DD-0.5)*GEOM2(M)+GEOM1(M))/(GEOM1(M)+GEOM2(M)/2.0)           DEPT 58
      RETURN                                                                 DEPT 59
C     FUNCTIONAL FORM FOR RECTANGULAR, TRIANGULAR BOTTOM.                    DEPT 60
```

```
  110 AA = ALPHA*AFULL(M)
      AB = GEOM3(M)*GEOM2(M)/2.0                                          DEPT 61
      IF (AA-AB) 111,113,115                                              DEPT 62
  111 DEPTH = GEOM3(M)/GEOM1(M)*SQRT(AA/AB)                               DEPT 63
      RETURN                                                              DEPT 64
  113 DEPTH = GEOM3(M)/GEOM1(M)                                           DEPT 65
      RETURN                                                              DEPT 66
  115 DEPTH = (GEOM3(M)+(AA-AB)/GEOM2(M))/GEOM1(M)                        DEPT 67
      RETURN                                                              DEPT 68
C     FUNCTIONAL FORM FOR RECTANGULAR, ROUND BOTTOM.                      DEPT 69
  120 AA = ALPHA*AFULL(M)                                                 DEPT 70
      IF (AA.GT.P6(M)) GO TO 125                                          DEPT 71
      ALF = ALPHA*AFULL(M)/(3.1415965*GEOM3(M)*GEOM3(M))                  DEPT 72
      I = ALF/0.02+1.0                                                    DEPT 73
      DEPTH = DNORM(1,I)+(DNORM(1,I+1)-DNORM(1,I))/0.02*(ALF-ANORM(1,I))  DEPT 74
      DEPTH = DEPTH*2.0*GEOM3(M)/(P2(M)*DIST(M))                          DEPT 75
      RETURN                                                              DEPT 76
  125 DD = P2(M)*DIST(M)-GEOM1(M)                                         DEPT 77
      DEPTH = (DD+(AA-P6(M))/GEOM2(M))/(P2(M)*DIST(M))                    DEPT 78
      RETURN                                                              DEPT 79
      END                                                                 DEPT 80
                                                                          DEPT 81
```

```
      FUNCTION DPSI(ALPHA)                                                  DPSI  1
C     FINDS DERIVATIVE OF FUNCTIONAL Q-A CURVE GIVEN A/AFULL (ALPHA).       DPSI  2
C*****NOTE, FOR NT=2,10,11,12, SUB PSI MUST HAVE BEEN CALLED PRIOR TO       DPSI  3
C     DPSI.                                                                 DPSI  4
C     THIS WILL ALWAYS BE THE CASE IF DPSI IS CALLED ONLY FROM NEWTON.      DPSI  5
      COMMON /PSIDPS/ AA,AB,D1,D2,AAA,CATH,ALF,I,R                          DPSI  6
      COMMON/TABLES/KDEPTH(25),KLASS(25),PSIMAX(15),ALFMAX(15),             DPSI  7
     1              NN(25),MM(25),ANORM(15,51),QNORM(15,51),               DPSI  8
     2              DNORM(15,51),AFACT(15),RFACT(15)                       DPSI  9
      COMMON A(160,2,2) ,Q(160,2,2) , CPOLL(160,2,2,3), QMAX(150),          DPSI 10
     1       CFULL(160), AFULL(160), DXDT(160),C1(160), SLOPE(160),         DPSI 11
     2       DIST(160), GEOM1(160), ROUGH(160), NOE(160), NUE(160,3),       DPSI 12
     3       INUE(160,3), NTYPE(160), JP(160), NKLASS, NE, NDT, EPSIL,      DPSI 13
     4       TIME, DT, M, KFULL, N, NOS, NPOLL, NPRINT, ITER,               DPSI 14
     5       QDWF(160), IOLD(160), P1(160), RNOFF(160), QINFIL(160),        DPSI 15
     6       WDWF(160,3), PLUTO(160,3), IR(160), P2(160), NIN(1000),        DPSI 16
     7       P5(160),P6(160),P7(160),SCF(160),BARREL(160),                  DPSI 17
     8       TITLE(40), NPE(20), NYN(20), NORDER(70), GEOM2(160),           DPSI 18
     9       GEOM3(160) , P4(160),SCOUR(160), KSTORE(160)                   DPSI 19
      COMMON  BODIN( 2,150),SSIN( 2,150),BODOUT,SSOUT,COLIN(2,150),         DPSI 20X
     *  QINST,COLST,QINSTL( 2),QOUSTL( 2),STORL( 2),QOUTO( 2),STORO( 2),DPSI 21
     *  NSTOR,KSTOR,IPRINT( 2),IPOL( 2),IFLOOD( 2),ICOST( 2),DEPMAX( 2),DPSI 22
     *  ATERM( 2,11),AU2DT2( 2,11),BDEPTH( 2,11),BSTOR( 2,11),COLOUT,     DPSI 23X
     *  DUMSTR(11),CUMDEP(11),                                            DPSI 24
     *  KTSTEP,VOLIN( 2,150),VOLOUT( 2,150),STOR,CUMIN( 2),CUMOUT( 2),    DPSI 25
     *  SBOD( 2),SSS( 2),SCOL( 2),                                        DPSI 26X
     *  ISTMOD( 2),ISTTYP( 2),ISTOUT( 2),                                 DPSI 27
     *  QPUMP( 2),DSTART( 2),DSTOP( 2),                                   DPSI 28
     *  DTON( 2),STORMX( 2),DTPUMP( 2),DTMORE( 2),STORF( 2),APLAN( 2),    DPSI 29
     *  CLAND( 2),CSTOR( 2),CPS( 2),CTOTAL( 2),CPCUYD( 2),CPACRE( 2),     DPSI 30
     *  LP,JP,LPREV( 2),LABEL,DETENT(150),FRAC(150),OUT1(10,200)          DPSI 31X
      NT = NTYPE(M)                                                         DPSI 32
      IF(NT.EQ.2) GO TO 30                                                  DPSI 33
      IF (NT.EQ.10) GO TO 100                                               DPSI 34
      IF (NT.EQ.11) GO TO 110                                               DPSI 35
      IF (NT.EQ.12) GO TO 120                                               DPSI 36
C     INCLUDE TABULAR DPSI CALC. IN CASE DPSI IS CALLED BY KLASS=2          DPSI 37
C     CONDUIT.                                                              DPSI 38
      MMM = MM(NT)                                                          DPSI 39
      DALPHA = ANORM(NT,2)-ANORM(NT,1)                                      DPSI 40
      I = ALPHA/DALPHA+1.0                                                  DPSI 41
      IF (I.EQ.MMM) I=I-1                                                   DPSI 42
      DPSI = (QNORM(NT,I+1)-QNORM(NT,I))/(ANORM(NT,I+1)-ANORM(NT,I))        DPSI 43
      RETURN                                                                DPSI 44
C     SPECIAL FUNCTIONAL FORM FOR RECTANGULAR CONDUITS.                     DPSI 45
   30 CONTINUE                                                              DPSI 46
      IF(ALPHA.LE.0.0) GO TO 45                                             DPSI 47
      IF (ALPHA.GT.ALFMAX(NT)) GO TO 35                                     DPSI 48
      IF (ALPHA.LT.0.0001) GO TO 40                                         DPSI 49
      DPSI = CATH*(P6(M)*ALPHA/AAA+1.666667)                                DPSI 50
      RETURN                                                                DPSI 51
   35 DPSI = (1.0-P4(M))/(1.0-ALFMAX(NT))                                   DPSI 52
      RETURN                                                                DPSI 53
   40 IF (ALPHA.LE.1.0E-30) GO TO 45                                        DPSI 54
      DPSI = 1.666667*(ALPHA*P7(M))**0.6666667                              DPSI 55X
      RETURN                                                                DPSI 56
   45 DPSI = 1.0E-30                                                        DPSI 57
      RETURN                                                                DPSI 58
C     FUNCTIONAL FORM FOR MODIFIED BASKET-HANDLE.                           DPSI 59
  100 IF (ALPHA.EQ.0.0) GO TO 45                                            DPSI 60
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      IF (AA.GT.GEOM3(M)) GO TO 105                                          DPSI 61
      IF (ALF.LT.0.0001) GO TO 103                                           DPSI 62
      DPSI = CATH*(-1.333333*R*ALF/AAA+1.666667)*AFULL(M)/GEOM3(M)           DPSI 63X
      RETURN                                                                 DPSI 64
  103 DPSI = P6(M)*1.666667*(ALF*P7(M))**0.6666667*AFULL(M)/GEOM3(M)         DPSI 65X
      RETURN                                                                 DPSI 66
  105 DPSI = (PSI(ALPHA+0.0005)-PSI(ALPHA-0.0005))/0.01                      DPSI 67
      RETURN                                                                 DPSI 68
C     FUNCTIONAL FORM FOR RECTANGULAR, TRIANGULAR BOTTOM.                    DPSI 69
  110 IF (ALPHA.EQ.0.0) GO TO 45                                             DPSI 70
      IF (AA.GT.AB) GO TO 115                                                DPSI 71
      DPSI = P7(M)*1.333333*ALPHA**0.3333333                                 DPSI 72
      RETURN                                                                 DPSI 73
  115 IF (ALPHA.GT.ALFMAX(NT)) GO TO 35                                      DPSI 74
      DPSI=CATH*(-0.6666667*ALPHA/AAA*(2.0*GEOM1(M)-GEOM3(M))+1.666667)      DPSI 75
      RETURN                                                                 DPSI 76
C     FUNCTIONAL FORM FOR RECTANGULAR, ROUND BOTTOM.                         DPSI 77
  120 IF (ALPHA.EQ.0.0) GO TO 45                                             DPSI 78
      IF (AA.GT.F6(M)) GO TO 125                                             DPSI 79
      DPSI = (CNORM(1,I+1)-CNORM(1,I))/0.02*P7(M)                            DPSI 80
      RETURN                                                                 DPSI 81
  125 IF (ALPHA.GT.ALFMAX(NT)) GO TO 35                                      DPSI 82
      DPSI = CATH*(1.666667-1.333333*AFULL(M)/GEOM2(M)/D2)                   DPSI 83
      RETURN                                                                 DPSI 84
      END                                                                    DPSI 85
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      SUBROUTINE DWLOAD(DWDAYS)                                          DWLO  1
C     THIS SUBROUTINE SETS UP INITIAL CONDITIONS OF SEDIMENTATION        DWLO  2
C     BASED UPON  'DWDAYS' OF DRY WEATHER FLOW PRIOR TO THE STORM        DWLO  3
      DIMENSION QI(160),QO(160),QU1(160),QO2(160)                        DWLO  4
      COMMON/DRWF/ DVDWF(7),DVBOD(7),DVSS(7),HVDWF(24),HVBOD(24),        DWLO  5
     1             HVSS(24),HVCOLI(24),KTNUM,KDAY,KHOUR,KMINS           DWLO  6
      COMMON/TABLES/KDEPTH(25),KLASS(25),PSIMAX(15),ALFMAX(15),          DWLO  7
     1              NN(25),MM(25),ANORM(15,51),QNORM(15,51),             DWLO  8
     2              DNORM(15,51),AFACT(15),RFACT(15)                     DWLO  9
      COMMON A(160,2,2) ,Q(160,2,2) , CPOLL(160,2,2,3), QMAX(160),       DWLO 10
     1       QFULL(160), AFULL(160), DXDT(160),C1(160), SLOPE(160),      DWLO 11
     2       DIST(160), GEOM1(160), ROUGH(160), NOE(160), NUF(160,3),    DWLO 12
     3       INUE(160,3), NTYPE(160), JR(160), NKLASS, NE, NDT, EPSIL,   DWLO 13
     4       TIME, DT, M, KFULL, N, NOS, NPULL, NPRINT, ITER,            DWLO 14
     5       QDWF(160), IOLD(160), P1(160), RNOFF(160), QINFIL(160),     DWLO 15
     6       WDWF(160,3), PLUTO(160,3), IR(160), P2(160), NIN(1000),     DWLO 16
     7       P5(160),P6(160),P7(160),SCF(160),BARREL(160),               DWLO 17
     8       TITLE(40), NPE(20), NYN(20), NORDER(70), GEOM2(160),        DWLO 18
     9       GEOM3(160) , P4(160),SCOUR(160), KSTORE(160)                DWLO 19
      COMMON  BODIN( 2,150),SSIN( 2,150),BODOUT,SSOUT,COLIN(2,150),      DWLO 20X
     *  QINST,QOUST,QINSTL( 2),QOUSTL( 2),STORL( 2),QOUTO( 2),STORO( 2),DWLO 21
     *  NSTOR,KSTOR,IPRINT( 2),IPOL( 2),IFLOOD( 2),ICOST( 2),DEPMAX( 2),DWLO 22
     *  ATERM( 2,11),AO2ST2( 2,11),BDEPTH( 2,11),BSTOR( 2,11),COLOUT,   DWLO 23X
     *  DUMSTR(11),DUMDEP(11),                                           DWLO 24
     *  KTSTEP,VOLIN( 2,150),VOLOUT( 2,150),STOR,CUMIN( 2),CUMOUT( 2),   DWLO 25
     *  SBOD( 2),SSS( 2),SCOL( 2),                                       DWLO 26X
     *  ISTMOD( 2),ISTTYP( 2),ISTOUT( 2),                                DWLO 27
     *  QPUMP( 2),DSTART( 2),DSTOP( 2),                                  DWLO 28
     *  DTON( 2),STORMX( 2),DTPUMP( 2),DTMORE( 2),STORF( 2),APLAN( 2),   DWLO 29
     *  CLAND( 2),CSTOR( 2),CPS( 2),CTOTAL( 2),CPOUYD( 2),CPACRE( 2),    DWLO 30
     *  LP,JP,LPREV( 2),LABEL,DETENT(150),FRAC(150),OUT1(10,200)         DWLO 31X
      EQUIVALENCE (QO1(1),QMAX(1)),(QO2(1),QFULL(1))                     DWLO 32
      EQUIVALENCE (QO(1),Q(1,2,2)),(QI(1),Q(1,1,2))                      DWLO 33
      REAL KVAL                                                          DWLO 34
      DO 10 IK=1,NE                                                      DWLO 35
   10 SCOUR(IK)=0.0                                                      DWLO 36
C     BEGIN DO LOOP ON HOUR OF DAY                                       DWLO 37
      DO 200 KJ=1,24                                                     DWLO 38
C     MODEL DWF FOR AN HOUR                                              DWLO 39
C     START WITH EMPTY SEWER EACH HOUR(EXCEPT FOR ANY DEPOSITION FROM    DWLO 40
C     PREVIOUS HOUR                                                      DWLO 41
      DO 5 IK=1,NE                                                       DWLO 42
      Q(IK,1,1)=0.0                                                      DWLO 43
      Q(IK,2,1)=0.0                                                      DWLO 44
      CPOLL(IK,2,1,2)=0.0                                                DWLO 45
      CPOLL(IK,1,1,2)=0.0                                                DWLO 46
    5 CONTINUE                                                           DWLO 47
      DO 100 I=1,NE                                                      DWLO 48
      M=JR(I)                                                            DWLO 49
      SUM1=0.0                                                           DWLO 50
      SUM2=0.0                                                           DWLO 51
C     ADD UP UPSTREAM FLOWS AND CONVERT LOADS TO LBS/SEC                 DWLO 52
      DO 20 J=1,3                                                        DWLO 53
      L=INUE(M,J)                                                        DWLO 54
      NTU=NTYPE(L)                                                       DWLO 55
      IF(NTU.LE.17.OR.NTU.GE.23) GO TO 18                                DWLO 56
      KK=GEOM3(L)                                                        DWLO 57
      QQ=QO2(L)                                                          DWLO 58
      IF(NUE(M).EQ.KK) QQ=QO1(L)                                         DWLO 59
      GO TO 19                                                           DWLO 60
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   18 QQ=Q(L,2,1)*BARREL(L)                                                  DWLO 61
   19 SUM1=SUM1+QQ                                                          DWLO 62
   20 SUM2=SUM2+CPOLL(L,2,1,2)*QQ                                           DWLO 63
C     ADD DWF AND INFILTRATION FOR THIS HOUR                               DWLO 64
      SUM1=SUM1+QDWF(M)*HVDWF(KJ)      + QINFIL(M)                         DWLO 65
      SUM2=SUM2+WDWF(M,2)*HVSS(KJ)*HVDWF(KJ)                               DWLO 66
      Q(M,1,1)=SUM1/BARREL(M)                                              DWLO 67
      Q(M,2,1)=Q(M,1,1)                                                    DWLO 68
C     CALCULATE LOADS IN LBS/CF                                            DWLO 69
      IF(SUM1.LE.0.0) GO TO 100                                            DWLO 70
      CPOLL(M,1,1,2)= SUM2/SUM1                                            DWLO 71
      CPOLL(M,2,1,2)=SUM2/SUM1                                             DWLO 72
      NT=NTYPE(M)                                                          DWLO 73
      IF (NT.EQ.22) GO TO 28                                               DWLO 74
      IF(NT.LT.18.OR.NT.GT.22) GO TO 30                                    DWLO 75
C     IN A FLOW DIVIDER TYPE ELEMENT, ASSUME ALL DWF IS NOT DIVERTED.      DWLO 76
      QQ1(M)=SUM1                                                          DWLO 77
      QQ2(M)=0.0                                                           DWLO 78
      GO TO 30                                                             DWLO 79
   28 QQ1(M) = 0.0                                                         DWLO 80
      QQ2(M) = SUM1                                                        DWLO 81
C     IF A NON-CONDUIT DO NOT CALCULATE ANY DEPOSITION                     DWLO 82
   30 IF(KLASS(NT).EQ.3) GO TO 100                                         DWLO 83
C     ASSUME UNIFORM AREA OF FLOW THROUGHOUT ELEMENT                       DWLO 84
      PS=Q(M,1,1)/QFULL(M)                                                 DWLO 85
      CALL FINDA(PS,A(M,1,1))                                              DWLO 86
C     FIND HYDRAULIC RADIUS GIVEN THE FLOW AREA.                           DWLO 87
      AREAF=A(M,1,1)                                                       DWLO 88
      RHYD=RADH(AREAF)                                                     DWLO 89
C     DETERMINE AMOUNT OF DEPOSITION AND SCOUR                             DWLO 90
      SPG=2.7                                                              DWLO 91
      KVAL=.056                                                            DWLO 92
C     FIND THE CRITICAL DIAMETER FOR MOTION OF SOLIDS.                     DWLO 93
      CRITD=RHYD*SLOPE(M)/(KVAL*(SPG-1.0))                                 DWLO 94
      CRITD=CRITD*304.8                                                    DWLO 95
      IF(CRITD.LE..59) PCT1=-1.2471*CRITD+1.0                              DWLO 96
      IF(CRITD.GT..59.AND.CRITD.LE.2.0) PCT1=-.1501*CRITD+.3527            DWLO 97
      IF(CRITD.GT.2.0.AND.CRITD.LE.10.0) PCT1=-.00656*CRITD+.0656          DWLO 98
      IF(CRITD.GT.10.0) PCT1=0.0                                           DWLO 99
      IF(CRITD.LE.0.0) PCT1=1.0                                            DWLO100
      PCT2=PCT1                                                            DWLO101
      SCOUR(M)=SCOUR(M)+PCT2*SUM2*3600.                                    DWLO102
      SUM3=(1.0-PCT2)*SUM2+(1.0-PCT1)*SCOUR(M)/3600.                       DWLO103
      CPOLL(M,1,1,2)= SUM3 /SUM1                                           DWLO104
      CPOLL(M,2,1,2)=CPOLL(M,1,1,2)                                        DWLO105
      SCOUR(M)=PCT1*SCOUR(M)                                               DWLO106
  100 CONTINUE                                                             DWLO107
  200 CONTINUE                                                             DWLO108
C     ASSUME SAME BED LOAD ACCUMULATION FOR EACH DWDAY                     DWLO109
      DO 210 I=1,NE                                                        DWLO110
      M=JR(I)                                                              DWLO111
      SCOUR(M)=DWDAYS*SCOUR(M)                                             DWLO112
C     SET UPPER LIMIT OF BED LOAD AS HALF OF PIPE VOLUME                   DWLO113
C     THE NUMBER 84.28=2.7*62.4/2.0                                        DWLO114
      ULIMIT=84.28*AFULL(M)*DIST(M)*BARREL(M)                              DWLO115
      IF(SCOUR(M).GT.ULIMIT) SCOUR(M)=ULIMIT                               DWLO116
  210 CONTINUE                                                             DWLO117
C     PRINT OUT INITIAL DWLOAD CONDITIONS                                  DWLO118
      WRITE(6,900) DWDAYS                                                  DWLO119
      WRITE(6,910)                                                         DWLO120
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      DO 220 I=1,NE                                                     DWL0121
      M=JR(I)                                                           DWL0122
      NT=NTYPE(M)                                                       DWL0123
      IF(KLASS(NT).GT.2) GO TO 220                                      DWL0124
      WRITE(6,920) NOE(M),SCOUR(M)                                      DWL0125
  220 CONTINUE                                                          DWL0126
  900 FORMAT('1',28X,'INITIAL BED OF SOLIDS (LBS) IN SEWER DUE TO'/,    DWL0127
     130X,F5.1,' DAYS OF DRY WEATHER PRIOR TO STORM '///)               DWL0128
  910 FORMAT(' ',31X,'ELEMENT',20X,'SOLIDS IN',/,32X,'NUMBER',23X,'BOTTODWL0129
     1M'/,62X,'(LBS)'///)                                               DWL0130
  920 FORMAT(' ',30X,I6,20X,F10.5)                                      DWL0131
      RETURN                                                            DWL0132
      END                                                               DWL0133
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      SUBROUTINE FILTH                                                      FILT  1
C     SUBROUTINE TO DETERMINE AVERAGE DAILY DWF QUAL AND QUAN               FILT  2
C     ***                                                                   FILT  3
      COMMON/CRWF/ CVDWF(7),DVBOD(7),DVSS(7),HVDWF(24),HVBOD(24),           FILT  4
     1             HVSS(24),HVCOLI(24),KTNUM,KDAY,KHOUR,KMINS               FILT  5
      COMMON/TABLES/KDEPTH(25),KLASS(25),PSIMAX(15),ALFMAX(15),             FILT  6
     1              AA(25),PM(25),ANORM(15,51),QNORM(15,51),                FILT  7
     2              DNORM(15,51),AFACT(15),RFACT(15)                        FILT  8
      COMMON A(160,2,2) ,Q(160,2,2) , CPOLL(160,2,2,3), QMAX(160),          FILT  9
     1       QFULL(160), AFULL(160), DXDT(160),C1(160), SLOPE(160),         FILT 10
     2       DIST(160), GEOM1(160), ROUGH(160), NOE(160), NUE(160,3),       FILT 11
     3       INUE(160,3), NTYPE(160), JR(160), NKLASS, NE, NDT, EPSIL,      FILT 12
     4       TIME, DT, H, KFULL, N, NOS, NPOLL, NPRINT, ITER,               FILT 13
     5       CDWF(160), IOLD(160), P1(160), RNOFF(160), QINFIL(160),        FILT 14
     6       WDWF(160,3), PLUTO(160,3), IR(160), P2(160), NIN(1000),        FILT 15
     7       P5(160),P6(160),P7(160),SCF(160),BARREL(160),                  FILT 16
     8       TITLE(40), NPE(20), NYN(20), NORDER(70), GEOM2(160),           FILT 17
     9       GEOM3(160) , P4(160),SCOUR(160), KSTORE(160)                   FILT 18
      COMMON  BODIN( 2,150),SSIN( 2,150),BODOUT,SSOUT,                      FILT 19X
     *  QINST,CQLST,QINSTL( 2),QQLSTL( 2),STORL( 2),QQUTO( 2),STURO( 2),FILT 20
     *  NSTOR,KSTOR,IPRINT( 2),IPOL( 2),IFLOOD( 2),ICOST( 2),DEPMAX( 2),FILT 21
     *  ATERM( 2,11),AO2DT2( 2,11),BDEPTH( 2,11),BSTOR( 2,11),COLOUT,     FILT 22X
     *  DUMSTR(11),DUMDEP(11),                                            FILT 23
     *  KTSTEP,VOLIN( 2,150),VOLOUT( 2,150),STOR,CUMIN( 2),CUMOUT( 2),    FILT 24
     *  SBOD( 2),SSS( 2),SCOL( 2),                                        FILT 25X
     *  ISTMOD( 2),ISTTYP( 2),ISTOUT( 2),                                 FILT 26
     *  QPUMP( 2),DSTART( 2),DSTOP( 2),                                   FILT 27
     *  DTON( 2),STORMX( 2),DTPUMP( 2),DTMORE( 2),STORF( 2),APLAN( 2),    FILT 28
     *  CLANC( 2),CSTOR( 2),CPS( 2),CTOTAL( 2),CPCUYD( 2),CPACRE( 2),     FILT 29
     *  LP,JP,LPREV( 2),LABEL,DETENT(150),FRAC(150),OUT1(10,200)          FILT 30X
C     ***                                                                   FILT 31
C     ********************************************************************* FILT 32
      READ DAILY AND HOURLY CORRECTION FACTORS FOR SEWAGE                   FILT 33
      READ(5,501) DVDWF,DVBOD,DVSS                                          FILT 34
  501 FORMAT(7F10.0)                                                        FILT 35
      READ(5,502) HVDWF,HVBOD,HVSS,HVCOLI                                   FILT 36
  502 FORMAT (8F10.0)                                                       FILT 37
C                                                                           FILT 38
C**********                                                                 FILT 39
C                                                                           FILT 40
C     READ TOTAL NUMBER OF SUBAREAS, TYPE OF FLOW AND QUALITY DATA          FILT 41
C     AVAILABLE, NUMBER OF PROCESS FLOWS, TIME SIMULATION BEGINS( DAY,      FILT 42
C     HOUR, AND MINUTE), CURRENT VALUE OF THE CONSUMER PRICE INDEX,CPI,:    FILT 43
C     CURRENT VALUE OF THE COMPOSITE CONSTRUCTION COST INDEX, CCCI          FILT 44
      READ(5,503) KTNUM,KASE,NPF,KDAY,KHOUR,KMINS,CPI,CCCI,PUPULA          FILT 45
C  POPULA IS THE TOTAL POP IN ALL AREAS IN THOUSANDS                        FILT 46
  503 FORMAT (6I5,2F5.1,F10.3)                                              FILT 47
      WRITE(6,601)                                                          FILT 48
  601 FORMAT('1',27X,'QUANTITY AND QUALITY OF D W F FOR EACH SUBAREA'//)    FILT 49
C                                                                           FILT 50
C**********                                                                 FILT 51
C     COMPUTE TOTAL INFILTRATION WITHIN STUDY AREA                          FILT 52
      AINFIL=0.0                                                            FILT 53
      DO 415 KK=1,NE                                                        FILT 54
  415 AINFIL= AINFIL+QINFIL(KK)                                             FILT 55
C     AINFIL=4.4                                                            KINGTEMP
C                                                                           FILT 56
      IF(KASE.NE.1) ADWF=0.0                                                FILT 57
C  IF KASE = 1 THE AVERAGE FLOW AND CHARACTERISTICS ARE KNOWN FOR THE       FILT 58
C     ENTIRE AREA BUT NOT FOR THE INDIVIDUAL SUBAREAS (EG SEWAGE PLANT      FILT 59
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C      DATA)                                                                FILT 60
C   IF KASE = 2 NO SUCH DATA IS AVAILABLE                                   FILT 61
       IF (KASE - 1) 411,411,412                                            FILT 62
C                                                                           FILT 63
C**********KASE 1 FOLLOWS                                                  FILT 64
C                                                                           FILT 65
C   ADWF ETC. ARE THE AVE DAILY VALUES OF DRY WEATHER FLOW IN CFS, BOD INFILT 66
C      MG/L, SUSP SOLIDS IN MG/L , RESPECTIVELY                             FILT 67
C      (FOR EXAMPLE, FROM A TREATMENT PLANT SERVING THE ENTIRE STUDY AREAFILT 68
  411 READ(5,504) ADWF,ABOD,ASUSO,ACOLI                                     FILT 69
  504 FORMAT (3F10.0,E10.2)                                                 FILT 70
C   ACOLI IS THE VALUE OF TOTAL COLIFORMS IN MPN/100ML                      FILT 71
C   READ TOTAL AREA TO PLANT, INDUSTRIAL AREA, COMMERCIAL, RESIDENTIAL      FILT 72
C      HIGH INCOME, RESIDENTIAL AVE INCOME, RESIDENTIAL LOW INCOME, RESI-FILT 73
C      DENTIAL WITH GARBAGE GRINDERS, PARKS AND OPEN AREA - ALL IN ACRES FILT 74
C   AND TOTAL POPULATION                                                    FILT 75
       READ (5,505) TOTA, TINA, TCA, TRHA, TRAA, TRLA, TRGGA, TPOA          FILT 76
  505 FORMAT (8F8.0)                                                        FILT 77
C   COMPUTE TOTAL BOD AND SUSPENDED SOLIDS IN POUNDS PER DAY                FILT 78
       TOTBOD= (ADWF/1.547)*ABOD*8.34                                       FILT 79
       TOTSS=(ADWF/1.547)*ASUSO*8.34                                        FILT 80
C   COMPUTE TOTAL COLIFORMS IN MPN/DAY                                      FILT 81
       TCOLI=ACOLI*ADWF*2.447E+7                                            FILT 82
C   MAKE DATA CORRECTION FOR INFILTRATION                                   FILT 83
       C1DWF= ADWF- AINFIL                                                  FILT 84
C   MAKE DATA CORRECTION FOR PROCESS FLOWS                                  FILT 85
C   FIRST INITIALIZE SUMATION QUANTITIES                                    FILT 86
       SUMQPF=0.0                                                           FILT 87
       SUMBOD=0.0                                                           FILT 88
       SUMSS=0.0                                                            FILT 89
C      NPF IS NUMBER OF PROCESS FLOWS                                       FILT 90
       IF(NPF.LE.0) GO TO 416                                               FILT 91
       DO 500 JJ=1,NPF                                                      FILT 92
C   READ PROCESS FLOW CHARACTERISTICS AND LOCATIONS                         FILT 93
       READ(5,506) INPUT, QPF, BODPF, SUSPF                                 FILT 94
  506 FORMAT(I5,6F10.3)                                                     FILT 95
       SUMQPF=SUMQPF + QPF                                                  FILT 96
       SUMBOD=SUMBOD +(QPF/1.547)*BODPF*8.34                                FILT 97
       SUMSS=SUMSS + (QPF/1.547)*SUSPF*8.34                                 FILT 98
  500 CONTINUE                                                              FILT 99
  416 C2DWF=C1DWF-SUMQPF                                                    FILT100
       IF(C2DWF.LE.0.0) GO TO 412                                           FILT101
       C1BOD=TOTBOD-SUMBOD                                                  FILT102
       C1SS=TOTSS-SUMSS                                                     FILT103
C    ****                                                                   FILT104
C   MAKE FINAL CORRECTIONS TO ALLOW FOR INCOME VARIATIONS, COMMERCIAL       FILT105
C      USE, GARBAGE GRINDERS, AND POPULATION                                FILT106
C      COMPUTE RESIDENTIAL AND COMMERCIAL AREA CONTRIBUTING TO PLANT        FILT107
       TDWFA=TOTA-TINA-TPOA                                                 FILT108
C   COMPUTE WEIGHTED DWFA BASED ON EXPECTED VARIATIONS IN SEWAGE            FILT109
C      STRENGTH.                                                            FILT110
       WTDWFA= 0.9*TCA+1.2*TRHA+1.0*TRAA+0.8*TRLA+1.3*TRGGA                 FILT111
C   COMPUTE CORRECTION FACTOR TO WEIGHT SEWAGE STRENGTH - NOTE BOD AND      FILT112
C      SS ARE AFFECTED EQUALLY                                              FILT113
       TDTR=TDWFA+TRGGA                                                     FILT114
       IF(TDTR.LE.0.0) CF=1.0                                               FILT115
       IF(TDTR.LE.0.0) GO TO 413                                            FILT116
       CF=WTDWFA/TDWFA                                                      FILT117
C   MODIFY MEASURED STRENGTHS TO PERMIT WEIGHTING IN SUBAREA COMPS          FILT118
  413 C2BOD=C1BOD/CF                                                        FILT119
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      C2SS=C1SS/CF                                                      FILT120
      IF(C2BCD.LE.0.0) C2BOD=0.0                                        FILT121
      IF(C2SS.LE.0.0) C2SS= 0.0                                         FILT122
C     ***                                                               FILT123
C  COMPUTE AVERAGE CORRECTED AND WEIGHTED DWF CHARACTERISTICS IN        FILT124
C     LBS/DAY/CFS.                                                      FILT125
      A1BOD=C2BCD/C2DWF                                                 FILT126
      A1SS=C2SS/C2DWF                                                   FILT127
      A1COLI=TCOLI/(POPULA*1000.)                                       FILT128
C  A1COLI IS THE AVERAGE NUMBER OF COLI PER CAPITA PER DAY              FILT129
      GO TO 414                                                         FILT130
C                                                                       FILT131
C**********KASE 2 FOLLOWS                                              FILT132
C                                                                       FILT133
C  IN THE EVENT MEASURED FLOW CHARACTERISTICS ARE NOT AVAILABLE ASSUME  FILT134
C     FOR A1BOD,  A1SS, AND A1COLI                                      FILT135
  412 A1BOD=1300.                                                       FILT136
C  THIS ASSUMES 85 CAL/CAP/DAY AND 0.20LBS/CAP/DAY FOR AVE INCOME       FILT137
      A1SS=1420.                                                        FILT138
C  THIS ASSUMES 85 CAL/CAP/DAY AND 0.22 LBS/CAP/DAY FOR AVE INCOME      FILT139
      A1COLI=2.00E+11                                                   FILT140
C  A1COLI,MPN/DAY/CAP, ASSUMES 200 BILLION COLIFORMS PER CAPITA PER DAY FILT141
      ADWF=POPULA*1000.*1.547*100./1000000.                             FILT142
C  THIS ASSUMES 100 GAL/CAP/DAY INCLUDING INFILTRATION                  FILT143
C                                                                       FILT144
C**********                                                            FILT145
C                                                                       FILT146
  414 WRITE (6,602) A1BOD, A1SS, A1COLI, ADWF                           FILT147
  602 FORMAT ('0',19X,'A1BOD =', F10.2,'LBSPERDAY/CFS'/21X,             FILT148
     . 'A1SS =', F10.2,' LBSPERDAY/CFS'/19X,'A1COLI =',1PE11.2,         FILT149
     . ' MPN/DAY PER CAPITA'/21X,'ADWF =',0PF10.2,' CFS'//)             FILT150
C     ***                                                               FILT151
      SMMDWF=0.00                                                       FILT152
      SMMBOD=0.00                                                       FILT153
      SMMSS=0.00                                                        FILT154
      TOTPOP=0.0                                                        FILT155
      SMMQQ=0.0                                                         FILT156
      WRITE(6,603)                                                      FILT157
  603 FORMAT ('0','KNUM',1X,'INPUT',7X,'DWF',2X,'+',2X,'INFIL',2X,'=',2XFILT158
     .,'QQDWF',1X,'KLAND',5X,'DWBOD',7X,'DWSS',9X,'TOTPOP',3X,'BODCONC' FILT159
     .,4X,'SSCONC',4X,' COLIFORMS')                                     FILT160
      WRITE (6,604)                                                     FILT161
  604 FORMAT (' ',17X,'CFS',6X,'CFS',7X,'CFS',11X,'LBS/MIN',4X,'LBS/MIN'FILT162
     . ,7X,'PERSONS',5X,'MG/L',6X,'MG/L',5X,' MPN/100ML'//)             FILT163
      QQ=0.0                                                            FILT164
      QQDWF=0.0                                                         FILT165
      SMTDWF=0.0                                                        FILT166
C                                                                       FILT167
C**********TIMESTEP COMPUTATIONS FOLLOW                                 FILT168
C**********FLOW                                                        FILT169
C                                                                       FILT170
      DO 300 I=1,KTNUM                                                  FILT171
      DWF=0.0                                                           FILT172
C     COMPUTE DWF FOR EACH SUBAREA                                      FILT173
C     SUBAREAS IN A CITY ARE CHOSEN PRIMARILY ON LAND USE CRITERIA      FILT174
      READ(5,507)KNUM,INPUT,KLAND,METHOD,KUNIT,WATER,PRICE,SEWAGE,ASUB, FILT175
     1POPDEN,DWLNGS,FAMILY,VALUE,PCGG,SAOPF,SABPF,SASPF,XINCOM,MSUBT    FILT176
  507 FORMAT(2I3,3I1,13F5.0,I2)                                         FILT177X
C     DATA CHECK AND ASSUMPTIONS NECESSARY TO OVERCOME MISSING DATA     FILT178
C     IF HOUSE VALUATION(VALUE) IS UNDEFINED, ASSUME $20,000 HOMES      FILT179
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  110 IF(VALUE)111,111,112                                                  FILT180
  111 VALUE=20.0                                                            FILT181
C     CHECK ON WHETHER POPULATION DENSITY OR THE NUMBER OF DWELLINGS        FILT182
C     FOR EACH SUBAREA ARE INCLUDED AS INPUT DATA                           FILT183
C     CORRECT VALUE TO 1960 DOLLARS USING DEPARTMENT OF INTERIOR            FILT184
C     COMPOSITE CONSTRUCTION COST INDEX(1960 VALUE OF CCCI=103.0)           FILT185
  112 IF(CCCI.LE.0.0) CCCI= 103.0                                           FILT186
      VALUE= VALUE*103.0/CCCI                                               FILT187
      IF(DWLNGS)113,113,130                                                 FILT188
  113 IF(POPDEN)114,114,115                                                 FILT189
C     IF BOTH POPULATION DENSITY AND NUMBER OF DWELLINGS PER SUBAREA        FILT190
C     ARE NOT TABULATED, ASSUME 10 DWELLING UNITS PER ACRE                  FILT191
  114 DWLNGS=10.0*ASUB                                                      FILT192
      GO TO 130                                                             FILT193
  115 IF(FAMILY)116,116,117                                                 FILT194
C     IF POPULATION DENSITY BUT NOT NUMBER PER HOUSEHOLD(FAMILY) IS         FILT195
C     TABULATED, ASSUME FAMILY=3.0                                          FILT196
  116 FAMILY=3.0                                                            FILT197
  117 DWLNGS=POPDEN*ASUB/FAMILY                                             FILT198
C     METHOD USED TO ESTIMATE D W F WITH MEASURED SEWAGE OR WATER FLOWS     FILT199
  130 IF(SEWAGE)131,131,136                                                 FILT200
  131 IF(WATER)100,100,133                                                  FILT201
C     CHECK UNITS OF WATER DATA AND USE APPROPRIATE CONVERSION FACTOR       FILT202
  133 IF(KUNIT)135,135,134                                                  FILT203
  134 DWF=WATER/(30.4*24.*3600.)*1000.                                      FILT204
      GO TO 200                                                             FILT205
  135 DWF=WATER/(30.4*24.*3600.)*0.134*1000.                                FILT206
      GO TO 200                                                             FILT207
  136 DWF=SEWAGE                                                            FILT208
      GO TO 200                                                             FILT209
C     GO TO APPROPRIATE DWF ESTIMATE DEPENDING ON TYPE OF LAND USE          FILT210
C     TYPE 1 SINGLE FAMILY RESIDENTIAL                                      FILT211
C     TYPE 2 MULTI-FAMILY RESIDENTIAL                                       FILT212
C     TYPE 3 COMMERCIAL                                                     FILT213
C     TYPE 4 INDUSTRIAL                                                     FILT214
C     TYPE 5 UNDEVELOPED OR PARKLANDS                                       FILT215
  100 GO TO(10,20,30,40,50),KLAND                                           FILT216
C     METHOD TO ESTIMATE DWF IN SINGLE FAMILY RESIDENTIAL SUBAREAS          FILT217
C     CHECK ON WHETHER PRICE OF WATER IS INCLUDED AS INPUT DATA             FILT218
C     THIS DETERMINES WHICH OF LINAWEAVER'S EQUATION TO USE                 FILT219
C     LINAWEAVER'S EQUATIONS ALSO DEPEND ON WHETHER WATER IS METERED        FILT220
C     ASSUME FLAT RATE PRICING IF METERING IS NOT INDICATED IN DATA         FILT221
   10 IF(METHOD-1)20,11,20                                                  FILT222
   11 IF(PRICE)12,12,13                                                     FILT223
C     EQUATION 1 LINAWEAVER                                                 FILT224
   12 DWF=(178.+3.28*VALUE)*DWLNGS*0.134/(24.*3600.)                        FILT225
      GO TO 200                                                             FILT226
C     EQUATION 2 METERED WITH PUBLIC SEWER LINAWEAVER AND HOWE              FILT227
C     CORRECT PRICE TO 1965 DOLLARS USING THE CONSUMER PRICE INDEX(1965     FILT228
C     CPI=109.0)                                                            FILT229
   13 IF (CPI.LE.0.0) CPI= 109.9                                            FILT230
      PRICE= PRICE*109.9/CPI                                                FILT231
      DWF=(206.+3.47*VALUE-1.30*PRICE)*DWLNGS*0.134/(24.*3600.)             FILT232
      GO TO 200                                                             FILT233
C     METHOD TO ESTIMATE DWF IN MULTI-FAMILY RESIDENTIAL SUBAREAS           FILT234
C     CHECK ON WHETHER VALUE AND FAMILY ARE INCLUDED AS INPUT DATA          FILT235
   20 IF(FAMILY)21,21,22                                                    FILT236
   21 FAMILY=3.0                                                            FILT237
C     EQUATION 3 FLAT RATE AND APARTMENTS WITH PUBLIC SEWER L. AND H.       FILT238
   22 DWF=(28.9+4.39*VALUE+33.6*FAMILY)*DWLNGS*0.134/(24.*3600.)            FILT239
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      GO TO 200                                                          FILT240
C     DWF MODEL REQUIRES WATER OR SEWAGE INPUTS                          FILT241
C     TO ESTIMATE DWF FOR COMMERCIAL OR INDUSTRIAL SUBAREAS              FILT242
   30 DWF=DWF+SAQPF                                                      FILT243
      GO TO 200                                                          FILT244
   40 DWF=DWF+SAQPF                                                      FILT245
      GO TO 200                                                          FILT246
   50 DWF=0.0                                                            FILT247
  200 CONTINUE                                                           FILT248
      POP=ASUB*POPDEN                                                    FILT249
      TOTPOP=TOTPOP+POP                                                  FILT250
      IF(ADWF.LE.0.0) QQF=0.0                                            FILT251
      IF(ADWF.GT.0.0) QQF=AINFIL/ADWF                                    FILT252
      CQ=QQF*DWF                                                         FILT253
      IF(KLAND.NE.4) CQ=QQF*DWF                                          FILT253A
      IF(KLAND.EQ.4) CQ=0.0                                              FILT253B
      QQDWF=DWF+QQ                                                       FILT254
C                                                                        FILT255
C**********QUALITY                                                       FILT256
C                                                                        FILT257
C     COMPUTE DWF QUALITY FOR EACH SUBAREA                               FILT258
C     DAILY QUALITY AVERAGES ARE CONVERTED TO SUBAREA QUALITY RATES      FILT261
C     (LBS/SEC)                                                          FILT262
  201 CONTINUE                                                           FILT263
      C1DT=DT/(24.0*60.0*60.0)                                           FILT264
      IF(XINCOM.LE.0.0) XINCOM=VALUE/2.5                                 FILT265
      IF (KLAND.LE.2) GO TO 421                                          FILT266
      IF(KLAND.EQ.3) GO TO 422                                           FILT267
      IF (KLAND.EQ.4) GO TO 423                                          FILT268
  424 DWBOD=DWF*A1BOD*C1DT                                               FILT269
      DWSS=DWF*A1SS*C1DT                                                 FILT270
      GO TO 25                                                           FILT271
  422 DWBOD=DWF*0.9*A1BOD*C1DT                                           FILT272
      DWSS=DWF*0.9*A1SS*C1DT                                             FILT273
      GO TO 25                                                           FILT274
  423 DWBOD=(SAQPF/1.547)*SABPF*8.34*C1DT                                FILT275
      DWSS=(SAQPF/1.547)*SASPF*8.34*C1DT                                 FILT276
      GO TO 25                                                           FILT277
C  COMPUTE RESIDENTIAL STRENGTHS ON THE BASIS OF INCOME AND GARBAGE      FILT278
C     GRINDERS.                                                          FILT279
  421 DWBOD=DWF*A1BOC*C1DT                                               FILT280
      DWSS=DWF*A1SS*C1DT                                                 FILT281
      IF(XINCOM.GT.15.) DWBOD=1.2*DWBOD                                  FILT282
      IF (XINCOM.GT.15.)DWSS=1.2*DWSS                                    FILT283
      IF(XINCOM.LT.7.)DWBOD =0.8*DWBOD                                   FILT284
      IF(XINCOM.LT.7.) DWSS=0.8*DWSS                                     FILT285
      DWBOD=DWBOD+(0.3*PCGG*DWBOD)/100.                                  FILT286
      DWSS=DWSS+(0.3*PCGG*DWSS)/100.                                     FILT287
   25 DW1BOD=DWBOD*60./DT                                                FILT288
      DW1SS=DWSS*60./DT                                                  FILT289
      WRITE(6,605) KAUM,INPUT,DWF,QQ,QQDWF,KLAND,DW1BOD,DW1SS            FILT290
  605 FORMAT(' ',2I5,3F10.2,I6,1F11.2,1F11.2)                            FILT291
C  COMPUTE TOTAL QUANTITIES IN SYSTEM                                    FILT292
      SMMDWF=SMMDWF+ DWF                                                 FILT293
      SMMBOD=SMMBOD + DWBOD                                              FILT294
      SMMSS=SMMSS + DWSS                                                 FILT295
      SMMQQ=SMMQQ+QQ                                                     FILT296
      SMTDWF=SMMQQ+SMMDWF                                                FILT297
      IF(SMTDWF.LE.0.0) DWCOLI=0.0                                       FILT259X
      IF(SMTDWF.GT.0.0) DWCOLI=A1COLI*TOTPOP/(SMTDWF*2.447E+7)           FILT260X
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      D2COLI=A1CCLI*PCP/(60.*24.*60.)                                   FILT298
C  D2COLI  IS THE TOTAL DWF COLI FROM THE ASUB IN MPN/SEC               FILT299
      INPUT=NIN(INPUT)                                                  FILT300
      WDWF(INPUT,1)=(DWBOD/DT)+WDWF(INPUT,1)                            FILT301
      WDWF(INPUT,2)=(DWSS/DT)+WDWF(INPUT,2)                             FILT302
       WDWF(INPUT,3)=D2COLI+WDWF(INPUT,3)                               FILT303
      IF(MSUBT)800,800,426                                              FILT304
  426 BODCON=(SMMBOD*1000000.)/(SMTDWF*DT*7.48*8.34)                    FILT305
      SSCONC=(SMMSS*1000000.)/(SMTDWF*DT*7.48*8.34)                     FILT306
      WRITE(6,606) SMMDWF,SMMQQ,SMTDWF,SMMBOD,SMMSS,TOTPOP,BODCON,SSCONCFILT307
     .,DWCOLI                                                           FILT308
  606 FORMAT('0',10X,'SUBTOTALS'//11X,3F10.2,6X,1F11.2,' LBS', 1F7.2,' LFILT309
     *BS',3F10.0,3X,1PE10.2//)                                          FILT310
  800 CONTINUE                                                          FILT311
      QDWF(INPUT)=QDWF(INPUT)+DWF                                       FILT312
  300 CONTINUE                                                          FILT313
C                                                                       FILT314
C**********END OF TIMESTEP COMPUTATION                                  FILT315
C                                                                       FILT316
      BODCON=(SMMBOD*1000000.)/(SMTDWF*DT*7.48*8.34)                    FILT317
      SSCONC=(SMMSS*1000000.)/(SMTDWF*DT*7.48*8.34)                     FILT318
      WRITE (6,607) SMMDWF,SMMQQ,SMTDWF,SMMBOD,SMMSS,TOTPOP,BODCON,    FILT319
     .SSCONC, DWCOLI                                                    FILT320
  607 FORMAT ('0',10X,'TOTALS'//11X,3F10.2,6X,1F11.2,' LBS', 1F7.2,' LBSFILT321
     *',3F10.0,3X,1PE10.2)                                              FILT322
C**********                                                           FILT323
C                                                                       FILT324
      IF(KASE.NE.1) GO TO 430                                           FILT325
      IF(ADWF.EQ.0.) GO TO 430                                          FILT326
      CF2= ADWF/SMTDWF                                                  FILT327
      WRITE(6,608) ADWF,SMTDWF,CF2                                      FILT328
  608 FORMAT(/' COMPARISON OF MEASURED AND CALCULATED TOTAL SEWAGE      FILT329
     1 FLOW:   ADWF=',F6.2,' CFS  SMTDWF=',F6.2,' CFS'/' CORRECTION FACTFILT330
     *OR (CF2) OF',F5.2,' APPLIED TO THE DWF (QUANTITY AND QUALITY) AT FFILT331
     *ACH INLET')                                                       FILT332
      GO TO 431                                                         FILT333
  430 CF2=1.                                                            FILT334
C     CORRECTION FACTOR (CF2) APPLIED TO THE DWF (QUANTITY AND QUALITY) FILT335
C     WHEN ADWF IS MEASURED (KASE=1)                                    FILT336
  431 DO 432 I=1,NE                                                     FILT337
      WDWF(I,1)=WDWF(I,1)*CF2                                           FILT338
      WDWF(I,2)=WDWF(I,2)*CF2                                           FILT339
      WDWF(I,3)=WDWF(I,3)*CF2                                           FILT340
  432 QDWF(I)=QDWF(I)*CF2                                               FILT341
C                                                                       FILT342
C**********                                                           FILT343
C                                                                       FILT344
C     DAILY AND HOURLY CORRECTION FACTORS APPLIED WITHIN TRANSPORT MODELFILT345
      WRITE(6,609)                                                      FILT346
  609 FORMAT('1',T40,'DAILY AND HOURLY CORRECTION FACTORS',/T51         FILT347
     1,'FOR SEWAGE DATA'//,T35,'DAY',T50,'DVDWF',T60,'DVBOD',           FILT348
     2T70,'DVSS',T80,'DVCOLI'/)                                         FILT349
      WRITE(6,610) (I,DVDWF(I),DVBOD(I),DVSS(I),I=1,7)                  FILT350
  610 FORMAT(' ',T30,I3,12X,3F10.3)                                     FILT351
      WRITE(6,611)                                                      FILT352
  611 FORMAT('0',T35,'HOUR'/)                                           FILT353
      WRITE(6,612) (I,HVDWF(I),HVBOD(I),HVSS(I),HVCOLI(I),I=1,24)       FILT354
  612 FORMAT(' ',T30,I3,12X,4F10.3)                                     FILT355
      RETURN                                                            FILT356
      END                                                               FILT357
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      SUBROUTINE FINDA(PS,AA)                                                FIND  1
C     CALCULATES THE FLOW AREA IN CONDUITS GIVEN THE FLOW RATE.              FIND  2
      COMMON/TABLES/KDEPTH(25),KLASS(25),PSIMAX(15),ALFMAX(15),              FIND  3
     1              NN(25),MM(25),ANORM(15,51),QNORM(15,51),                FIND  4
     2              QNORM(15,51),AFACT(15),RFACT(15)                        FIND  5
      COMMON A(160,2,2) ,Q(160,2,2) , CPOLL(160,2,2,3), QMAX(160),           FIND  6
     1       QFULL(160), AFULL(160), DXDT(160),C1(160), SLOPE(160),          FIND  7
     2       DIST(160), GEOM1(160), ROUGH(160), NOE(160), NUE(160,3),        FIND  8
     3       INUE(160,3), NTYPE(160), JR(160), NKLASS, NE, NDT, EPSIL,       FIND  9
     4       TIME, DT, M, KFULL, N, NOS, NPOLL, NPRINT, ITER,                FIND 10
     5       QCHF(160), IOLD(160), P1(160), RNOFF(160), QINFIL(160),         FIND 11
     6       HDWF(160,3), PLUTO(160,3), IR(160), P2(160), NIN(1000),         FIND 12
     7       P5(160),P6(160),P7(160),SCF(160),BARREL(160),                   FIND 13
     8       TITLE(40), NPE(20), NYN(20), NORDER(70), GEOM2(160),            FIND 14
     9       GEOM3(160) , P4(160),SCOUR(160), KSTORE(160)                    FIND 15
      COMMON  BODIN( 2,150),SSIN( 2,150),BODOUT,SSOUT,COLIN(2,150),          FIND 16X
     *  QINST,CCLST,QINSTL( 2),QOUSTL( 2),STORL( 2),QOUTO( 2),STORO( 2),     FIND 17
     *  NSTOR,KSTOR,IPRINT( 2),IPOL( 2),IFLOOD( 2),ICOST( 2),DEPMAX( 2),     FIND 18
     *  ATERM( 2,11),AO2DT2( 2,11),BDEPTH( 2,11),BSTOR( 2,11),COLOUT,        FIND 19X
     *  DUMSTR(11),DUMDEP(11),                                               FIND 20
     *  KTSTEP,VOLIN( 2,150),VOLOUT( 2,150),STOR,CUMIN( 2),CUMOUT( 2),       FIND 21
     *  SBOD( 2),SSS( 2),SCOL( 2),                                           FIND 22X
     *  ISTMOD( 2),ISTTYP( 2),ISTOUT( 2),                                    FIND 23
     *  QPUMP( 2),DSTART( 2),DSTOP( 2),                                      FIND 24
     *  DTON( 2),STORMX( 2),DTPUMP( 2),DTMORE( 2),STORF( 2),APLAN( 2),       FIND 25
     *  CLANC( 2),CSTOR( 2),CPS( 2),CTOTAL( 2),CPCUYD( 2),CPACRE( 2),        FIND 26
     *  LP,JP,LPREV( 2),LABEL,DETENT(150),FRAC(150),OUT1(10,200)             FIND 27X
      AA = 0.0                                                               FIND 28
      IF (PS.EQ.C.C) RETURN                                                  FIND 29
      NT = NTYPE(M)                                                          FIND 30
      IF (KLASS(NT).EQ.1) GO TO 150                                          FIND 31
C     CONDUITS WITH TABULAR Q-A RELATIONSHIP.                                FIND 32
      MMM = MM(NT)                                                           FIND 33
      DALPHA = ANORM(NT,2)-ANORM(NT,1)                                       FIND 34
      DO 110 I=1,MMM                                                         FIND 35
      IF (PS-QNORM(NT,I+1)) 107,108,110                                      FIND 36
  107 ALPHA = ANORM(NT,I)+(PS-QNORM(NT,I))/(QNORM(NT,I+1)-QNORM(NT,1))*      FIND 37
     1DALPHA                                                                 FIND 38
      GO TO 111                                                              FIND 39
  108 ALPHA = ANORM(NT,I+1)                                                  FIND 40
      GO TO 111                                                              FIND 41
  110 CONTINUE                                                               FIND 42
  111 AA = ALPHA*AFULL(M)                                                    FIND 43
      RETURN                                                                 FIND 44
C     CONDUITS WITH FUNCTIONAL Q-A RELATIONSHIP.                             FIND 45
  150 C2 = -PS                                                               FIND 46
      ALPHA=0.2                                                              FIND 47
      CALL NEWTON(ALPHA,PS,0.0,C2,KFLAG)                                     FIND 48
      IF (KFLAG.EQ.2) GO TO 155                                              FIND 49
      AA = ALPHA*AFULL(M)                                                    FIND 50
      RETURN                                                                 FIND 51
  155 WRITE (6,910) TIME,N,NOE(M),A(M,1,1)                                   FIND 52
      AA = A(M,1,1)                                                          FIND 53
      RETURN                                                                 FIND 54
  910 FORMAT (/' **WARNING: NEWTON UNABLE TO FIND AREA GIVEN FLOW. TIME='    FIND 55
     1'F7.1,', TIME STEP='I3,', EXT. ELE. NUM.='I4,', USE OLD UPSTREAM AFIND 56
     2REA='F6.2)                                                             FIND 57
      END                                                                    FIND 58
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      SUBROUTINE FIRST                                                  FIRS  1
C     ROUTINE PERFORMS INITIAL CALCULATIONS FOR EACH SEWER ELEMENT.     FIRS  2
      DIMENSION QI(160),QO(160),WELL2(160),QO1(160),QO2(160),PUMP(160)  FIRS  3
     1    , SURGE1(160),SURGE2(160)                                     FIRS  4
      COMMON/NAMES/ NAME(4,25),GNO,YES,BLANK                            FIRS  5
      COMMON/TABLES/KDEPTH(25),KLASS(25),PSIMAX(15),ALFMAX(15),         FIRS  6
     1              AA(25),PM(25),ANORM(15,51),QNORM(15,51),           FIRS  7
     2              DNORM(15,51),AFACT(15),RFACT(15)                   FIRS  8
      COMMON A(160,2,2) ,Q(160,2,2) , CPOLL(160,2,2,3), QMAX(160),      FIRS  9
     1       QFULL(160), AFULL(160), DXDT(160),CI(160), SLOPE(160),     FIRS 10
     2       DIST(160), GEOM1(160), ROUGH(160), NOE(160), NUF(160,3),   FIRS 11
     3       INUE(160,3), NTYPE(160), JR(160), NKLASS, NE, NDT, EPSIL,  FIRS 12
     4       TIME, DT, M, KPOLL, N, NOO, NPOLL, NPRINT, ITER,           FIRS 13
     5       QOWF(160), IOLD(160), P1(160), RNOFF(160), QINFIL(160),    FIRS 14
     6       NOWF(160,3), PLUTO(160,3), IR(160), P2(160), NIN(1000),    FIRS 15
     7       P5(160),P6(160),P7(160),SCF(160),BARREL(160),              FIRS 16
     8       TITLE(40), NPE(20), NYN(20), NORDER(70), GEOM2(160),       FIRS 17
     9       GEOM3(160) , P4(160),SCOUR(160), KSTORE(160)               FIRS 18
      EQUIVALENCE (QO(1),Q(1,2,2)),(QI(1),Q(1,1,2))                     FIRS 19
      EQUIVALENCE (WELL2(1),ROUGH(1))                                   FIRS 20
      EQUIVALENCE (QO1(1),QMAX(1)),(QO2(1),QFULL(1))                    FIRS 21
      EQUIVALENCE (PUMP(1),DIST(1)),(SURGE1(1),P1(1)),(SURGE2(1),P2(1)) FIRS 22
C     CALCULATE AREAS AND MAX. FLOWS USING MANNING EQN. AND GEOMETRY.   FIRS 23
C     ALSO CALCULATE CERTAIN PARAMETERS USED IN ROUTING COMPUTATIONS.   FIRS 24
C     NTYPE=1 DENOTES CIRCULAR CONDUIT.                                 FIRS 25
C     NTYPE=2 DENOTES RECTANGULAR CONDUIT.                              FIRS 26
C     NTYPE=3 DENOTES PHILLIPS STANDARD EGG-SHAPED CONDUIT.             FIRS 27
C     NTYPE=4 DENOTES BOSTON HORSESHOE CONDUIT.                         FIRS 28
C     NTYPE=5 DENOTES GOTHIC CONDUIT.                                   FIRS 29
C     NTYPE=6 DENOTES CATENARY CONDUIT.                                 FIRS 30
C     NTYPE=7 DENOTES LOUISVILLE SEMI-ELLIPTIC CONDUIT.                 FIRS 31
C     NTYPE=8 DENOTES BASKET-HANDLE CONDUIT.                            FIRS 32
C     NTYPE=9 DENOTES SEMI-CIRCULAR CONDUIT.                            FIRS 33
C     NTYPE=10 DENOTES MODIFIED BASKET-HANDLE CONDUIT.                  FIRS 34
C     NTYPE=11 DENOTES RECTANGULAR CONDUIT, TRIANGULAR BOTTOM.          FIRS 35
C     NTYPE=12 DENOTES RECTANGULAR CONDUIT, ROUND BOTTOM.               FIRS 36
C     NTYPE=13,14,15 ARE USER SUPPLIED CONDUIT SHAPES.                  FIRS 37
C     NTYPE=16 DENOTES MANHOLE.                                         FIRS 38
C     NTYPE=17 DENOTES LIFT STATION.                                    FIRS 39
C     NTYPE=18 DENOTES TYPE 18 FLOW DIVIDER.                            FIRS 40
C     NTYPE=19 DENOTES STORAGE UNIT.                                    FIRS 41
C     NTYPE=20 DENOTES TYPE 20 FLOW DIVIDER.                            FIRS 42
C     NTYPE=21 DENOTES TYPE 21 FLOW DIVIDER.                            FIRS 43
C     NTYPE=22 DENOTES BACKWATER ELEMENT.                               FIRS 44
C     NTYPE=23,24,25 ARE NOT YET PROGRAMMED.                            FIRS 45
      K = 0                                                             FIRS 46
      DO 200 M=1,NE                                                     FIRS 47
      NT = NTYPE(M)                                                     FIRS 48
      GO TO (10,20,10,10,10,10,10,10,10,100,110,120,10,10,10,190,160,   FIRS 49
     1 190,190,190,170,190,190,190,190), NT                             FIRS 50
C     CALCULATIONS FOR SHAPES DESCRIBED BY TABULAR Q-A RELATIONSHIPS.    FIRS 51
C     GEOM1(M)=MAXIMUM VERTICAL DIMENSION FOR THESE SHAPES.             FIRS 52
C     UNITS OF FEET AND SECONDS ARE USED THROUGHOUT.                    FIRS 53
   10 AFULL(M) = AFACT(NT)*GEOM1(M)*GEOM1(M)                            FIRS 54
      P1(M) = 1.49/ROUGH(M)*AFULL(M)*(RFACT(NT)*GEOM1(M))**0.6666667    FIRS 55
      P2(M) = GEOM1(M)/DIST(M)                                          FIRS 56
      P4(M) = PSIMAX(NT)                                                FIRS 57
      GO TO 150                                                         FIRS 58
C     CALCULATIONS FOR RECTANGULAR CONDUIT.                             FIRS 59
   20 AFULL(M) = GEOM1(M)*GEOM2(M)                                      FIRS 60
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      RH = AFULL(M)/(2.0*(GECM1(M)+GEOM2(M)))                          FIRS 61
      P1(M) = 1.49/ROUGH(M)*AFULL(M)*RH**0.6666667                     FIRS 62
      P5(M) = GECM1(M)/GECM2(M)                                        FIRS 63
      P6(M) = -1.333333*P5(M)                                          FIRS 64
      P7(M) = 2.0*P5(M)+2.0                                            FIRS 65
      P2(M) = GECM1(M)/DIST(M)                                         FIRS 66
      P4(M) = PSI(ALFMAX(NT))                                          FIRS 67
      GO TO 150                                                        FIRS 68
C     CALCULATIONS FOR MODIFIED BASKET-HANDLE CONDUIT.                 FIRS 69
  100 GEOM3(M) = GEOM1(M)*GECM2(M)                                     FIRS 70
      P5(M) = 0.7853982*GEOM2(M)*GEOM2(M)                              FIRS 71
      AFULL(M) = GEOM3(M)+P5(M)/2.0                                    FIRS 72
      RH = AFULL(M)/(GEOM2(M)+2.570796*2.0*GEOM1(M))                   FIRS 73
      P1(M) = 1.49/ROUGH(M)*AFULL(M)*RH**0.6666667                     FIRS 74
      RH = GECM3(M)/(2.0*(GECM1(M)+GECM2(M)))                          FIRS 75
      P6(M) = 1.49/ROUGH(M)*GEOM3(M)*RH**0.6666667/P1(M)               FIRS 76
      ALM = (GECM3(M)+P5(M)*(ALFMAX(1)-0.5))/AFULL(M)                  FIRS 77
      P7(M) = 2.0*GECM1(M)/GEOM2(M)+2.0                                FIRS 78
      P2(M) = (GEOM1(M)+GEOM2(M)/2.0)/DIST(M)                          FIRS 79
      P4(M) = PSI(ALM)                                                 FIRS 80
      GO TO 150                                                        FIRS 81
C     CALCULATIONS FOR RECTANGULAR CONDUIT, TRIANGULAR BOTTOM.         FIRS 82
  110 AFULL(M) = GECM2(M)*(GEOM1(M)-GECM3(M)/2.0)                      FIRS 83
      P5(M) = 0.5*SIN(ATAN(2.0*GEOM3(M)/GEOM2(M)))                     FIRS 84
      P6(M) = GECM3(M)/P5(M)+2.0*(GEOM1(M)-GEOM3(M))+GEOM2(M)          FIRS 85
      RH = P5(M)/SQRT(2.0*GECM3(M)/GEOM2(M))*P6(M)                     FIRS 86
      P7(M) = RH**0.6666667/AFULL(M)**0.3333333                        FIRS 87
      P1(M) = 1.49/ROUGH(M)*AFULL(M)*(AFULL(M)/P6(M))**0.6666667       FIRS 88
      P2(M) = GEOM1(M)/DIST(M)                                         FIRS 89
      P4(M) = PSI(ALFMAX(NT))                                          FIRS 90
      GO TO 150                                                        FIRS 91
C     CALCULATIONS FOR RECTANGULAR CONDUIT, ROUND BOTTOM.              FIRS 92
  120 P5(M) = 2.0*ARSIN(GEOM2(M)/2.0/GEOM3(M))                         FIRS 93
      P6(M) = GEOM3(M)*GEOM3(M)/2.0*(P5(M)-SIN(P5(M)))                 FIRS 94
      AFULL(M) = GEOM2(M)*GECM1(M)+P6(M)                               FIRS 95
      RH = AFULL(M)/(GEOM3(M)*P5(M)+2.0*GEOM1(M)+GEOM2(M))             FIRS 96
      P1(M) = 1.49/ROUGH(M)*AFULL(M)*RH**0.6666667                     FIRS 97
      AA = 3.1415965*GEOM3(M)*GEOM3(M)                                 FIRS 98
      P7(M) = 1.49/ROUGH(M)*AA*(GEOM3(M)/2.0)**0.6666667/P1(M)         FIRS 99
      P2(M) = (GECM1(M)+GECM3(M)*(1.0-COS(P5(M)/2.0)))/DIST(M)         FIRS100
      P4(M) = PSI(ALFMAX(NT))                                          FIRS101
C     CALCULATIONS COMMON TO ALL CONDUITS.                             FIRS102
C     CONVERT SLOPE FROM FT./100 FT. TO FT./FT.                        FIRS103
  150 SLOPE(M) = SLOPE(M)*0.01                                         FIRS104
      QFULL(M) = P1(M)*SQRT(SLOPE(M))                                  FIRS105
      QMAX(M) = P4(M)*QFULL(M)                                         FIRS106
      DXDT(M) = DIST(M)/DT                                             FIRS107
      C1(M) = DXDT(M)*AFULL(M)/QFULL(M)                                FIRS108
C     DETERMINE IF FLOW IN CONDUIT IS SUPER-CRITICAL MOST OF TIME.     FIRS109
C     CRITERION IS DERIVED BY COMPARING NORMAL AND CRITICAL VELOCITIES. FIRS110
C     BOTH VELOCITIES DEPEND UPON DEPTH OF FLOW.                       FIRS111
C     FACTOR OF 0.3 CORRESPONDS TO CIRCULAR PIPE 95% FULL.             FIRS112
      AA=1.49/ROUGH(M)*SQRT(SLOPE(M)/32.2)*(P2(M)*DIST(M))**.1666667*0.3FIRS113
      SCF(M) = NO                                                      FIRS114
      IF (AA.GE.1.0) SCF(M) = YES                                      FIRS115
      GO TO 200                                                        FIRS116
C     CALCULATIONS FOR LIFT STATION.                                   FIRS117
C     INITIAL VOLUME IN WET WELL IS HALF THE CAPACITY.                 FIRS118
  160 WELL2(M) = 0.5*GEOM1(M)                                          FIRS119
      GO TO 150                                                        FIRS120
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C     DETERMINE NUMBER AND ELEMENT NUMBERS OF FLOW DIVIDER TYPE 21'S.   FIRS121
  170 K = K+1                                                           FIRS122
      IR(K) = M                                                         FIRS123
      GO TO 190                                                         FIRS124
C     INITIALIZE SURCHARGE VOLUME IN NON-CONDUITS.                      FIRS125
  190 SURGE1(M) = 0.0                                                   FIRS126
      SURGE2(M) = 0.0                                                   FIRS127
      SCF(M) = BLANK                                                    FIRS128
  200 CONTINUE                                                          FIRS129
      IF (K.EQ.0) RETURN                                                FIRS130
C     INITIALIZE FLOW SETTING FOR TYPE 21 FLOW DIVIDERS.                FIRS131
      DO 220 I=1,K                                                      FIRS132
      M= IR(I)                                                          FIRS133
      L=GEOM3(M)                                                        FIRS134
      L=NIN(L)                                                          FIRS135
  220 GEOM1(M)=(QFULL(L)/2.0)*BARREL(L)                                 FIRS136A
      RETURN                                                            FIRS137
      END                                                               FIRS138
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      SUBROUTINE INFIL                                                  INFI  1
      COMMON/TABLES/KDEPTH(25),KLASS(25),PSIMAX(15),ALFMAX(15),         INFI  2
     1              NA(25),MM(25),ANORM(15,51),QNORM(15,51),           INFI  3
     2              DNORM(15,51),AFACT(15),RFACT(15)                   INFI  4
      COMMON/NAMES/ NAME(4,25),GND,YES,BLANK                            INFI  5
      COMMON A(160,2,2) ,Q(160,2,2) , CPOLL(160,2,2,3), QMAX(160),      INFI  6
     1       CFULL(160), AFULL(160), DXDT(160),C1(160), SLOPE(160),     INFI  7
     2       DIST(160), GEOM1(160), ROUGH(160), NOE(160), NUE(160,3),   INFI  8
     3       IAUE(160,3), NTYPE(160), JR(160), NKLASS, NE, NDT, EPSIL,  INFI  9
     4       TIME, DT, M, KFULL, N, NOS, NPOLL, NPRINT, ITER,           INFI 10
     5       QCWF(160), IOLD(160), P1(160), RNOFF(160), QINFIL(160),    INFI 11
     6       WCWF(160,3), PIUTO(160,3), IR(160), P2(160), NIN(1000),    INFI 12
     7       P5(160),P6(160),P7(160),SCF(160),BARREL(160),              INFI 13
     8       TITLE(40), NPE(20), NYN(20), NORDER(70), GEOM2(160),       INFI 14
     9       GEOM3(160) , P4(160),SCOUR(160), KSTORE(160)               INFI 15
C     SUBROUTINE TO ESTIMATE AND ALLOCATE SEWER INFILTRATION            INFI 16
      DIMENSION NDD(12),NDXDAY(380)                                     INFI 17
      READ(5,500) DINFIL,GINFIL,RINFIL                                  INFI 18
      READ(5,501) NDYUD,RSMAX,ULEN                                      INFI 23X
   15 READ(5,510) (NDD(I),I=1,12)                                       INFI 25X
      SINFIL=0.0                                                        INFI 19
      IF(GINFIL)10,10,50                                                INFI 20
   10 SUMINF=DINFIL+RINFIL                                              INFI 21
      IF(SUMINF.EQ.0.0)WRITE(6,600)                                     INFI 22
      IF(RSMAX.LE.0.0) GO TO 200                                        INFI 24
      MFREZ=0                                                           INFI 26
      MLTBE=0                                                           INFI 27
      MLTEN=0                                                           INFI 28
C     PLACE MONTHLY VALUES AT MIDDLE OF MONTH                           INFI 29
      II=0                                                              INFI 30
      DO 100 I=1,12                                                     INFI 31
      NDDAY=II+15                                                       INFI 32
      NDXDAY(NDDAY)=NDD(I)                                              INFI 33
      II=II+30                                                          INFI 34
  100 CONTINUE                                                          INFI 35
C     INTERPOLATE FOR FIRST AND LAST 15 DAYS OF 'YEAR'                  INFI 36
      NX=345                                                            INFI 37
      NY1=NDXDAY(345)                                                   INFI 38
      NY2=NDXDAY(15)                                                    INFI 39
      NX1=345                                                           INFI 40
      NX2=375                                                           INFI 41
      DO 110 I=1,30                                                     INFI 42
      NX=NX+1                                                           INFI 43
      NY=((NY2-NY1)*(NX-NX1))/30 + NY1                                  INFI 44
      NDXDAY(NX)=NY                                                     INFI 45
  110 CONTINUE                                                          INFI 46
C     CONVERT LAST 15 DAYS TO FIRST 15                                  INFI 47
      NX=360                                                            INFI 48
      DO 120 I=1,15                                                     INFI 49
      NX=NX+1                                                           INFI 50
      NDXDAY(I)=NDXDAY(NX)                                              INFI 51
  120 CONTINUE                                                          INFI 52
C     INTERPOLATE FROM NDDAY=16 THRU NDDAY=344                          INFI 53
      K=1                                                               INFI 54
      NX=16                                                             INFI 55
      NX1=15                                                            INFI 56
      NX2=45                                                            INFI 57
  130 NY1=NDXDAY(NX1)                                                   INFI 58
      NY2=NDXDAY(NX2)                                                   INFI 59
      NY=((NY2-NY1)*(NX-NX1))/30 +NY1                                   INFI 60
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```
      NDXDAY(NX)=NY                                                    INFI 61
      K=K+1                                                            INFI 62
      NX=NX+1                                                          INFI 63
      IF(K.LE.30) GO TO 130                                            INFI 64
      NX1=NX1+30                                                       INFI 65
      NX2=NX2+30                                                       INFI 66
      K=1                                                              INFI 67
      IF(NX2.LE.345) GO TO 130                                         INFI 68
C     DETERMINE BEGINNING OF FREEZING PERIOD(MFREZ)                    INFI 69
      DO 150 I=1,360                                                   INFI 70
      IF(NDXDAY(I).GT.750) GO TO 160                                   INFI 71
  150 CONTINUE                                                         INFI 72
  160 MFREZ=I                                                          INFI 73
C     IF STORM DAY IS PRIOR TO FREEZING, SET SINFIL=0.0                INFI 74
      IF(NDYUD.LE.MFREZ) GO TO 200                                     INFI 75
C     STORM OCCURED AFTER FREEZING BEGAN                               INFI 76
      NTOT=0                                                           INFI 77
      DO 170 I=MFREZ,360                                               INFI 78
      IF(NDXDAY(I).LE.750) GO TO 175                                   INFI 79
  170 NTOT=NTOT+(NDXDAY(I)-750)                                        INFI 80
  175 NAREA1=NTOT                                                      INFI 81
      MLTBE=I                                                          INFI 82
      NTOT=0                                                           INFI 83
      IF(NDYUD.LT.MLTBE) GO TO 200                                     INFI 84
      DO 180 I=MLTBE,360                                               INFI 85
      NTOT=NTOT+(750-NDXDAY(I))                                        INFI 86
      IF(NTOT.GE.NAREA1) GO TO 185                                     INFI 87
  180 CONTINUE                                                         INFI 88
C     IF EQUAL AREA NOT REACHED SET MLTEN=360                          INFI 89
  185 MLTEN=I                                                          INFI 90
      IF(NDYUD.GE.MLTEN) GO TO 200                                     INFI 91
C     CALCULATE SINFIL                                                 INFI 92
      XMLTBE=FLOAT(MLTBE)                                              INFI 93
      XNDYUD=FLOAT(NDYUD)                                              INFI 94
      XMLTEN=FLOAT(MLTEN)                                              INFI 95
      XXARG= ((XNDYUD-XMLTBE)/(XMLTEN-XMLTBE))*3.1416                  INFI 96
      SINFIL=RSMAX*SIN(XXARG)                                          INFI 97
      GO TO 40                                                         INFI 98
  200 SINFIL=0.0                                                       INFI 99
   40 QINF=RINFIL+SINFIL+DINFIL                                        INFI100
      GO TO 60                                                         INFI101
   50 QINF=GINFIL                                                      INFI102
   60 CONTINUE                                                         INFI103
      OPINF=0.0                                                        INFI104
      IF(ULEN.LE.0.0)ULEN=6.0                                          INFI105
      ATERM=SQRT(4.0*3.1416)/ULEN                                      INFI106
      OPNFIL=0.0                                                       INFI107
      DO 70 K=1,NE                                                     INFI108
      M=JR(K)                                                          INFI109
      NT=NTYPE(M)                                                      INFI110
      IF(KLASS(NT).GT.2)GO TO 70                                       INFI111
      OPINF=ATERM*SQRT(AFULL(M))*DIST(M)+OPINF                         INFI112
   70 CONTINUE                                                         INFI113
      WRITE(6,615)                                                     INFI114
      WRITE(6,620)DINFIL,GINFIL,SINFIL,RINFIL                          INFI115
      WRITE(6,630)                                                     INFI116
      DO 80 K=1,NE                                                     INFI117
      M=JR(K)                                                          INFI118
      NT=NTYPE(M)                                                      INFI119
      IF(KLASS(NT).GT.2)GO TO 80                                       INFI120
```

```
      OPNFIL=ATERM*SQFT(AFULL(M))*DIST(M)                                    INFI121
      OP=OPNFIL/OPINF                                                        INFI122
      QINFIL(M)=QINF*OP/448.8                                                INFI123
      WRITE(6,640)NOE(M),QINFIL(M),OP                                        INFI124
   80 CONTINUE                                                               INFI125
  500 FORMAT(10F8.1)                                                         INFI126
  501 FORMAT(I5,6F8.1)                                                       INFI127
  510 FORMAT(16I5)                                                           INFI128
  600 FORMAT('1 NO FLOW ESTIMATES FOR DINFIL OR RINFIL WERE INCLUDED'//)     INFI129
  615 FORMAT('0',20X,'TOTAL AREA INFILTRATION(IN GPM) DUE TO:'//,            INFI130
     110X,'BASE FLOW',5X, GROUND WATER',11X,'MELT     ',5X,'  RAIN'//)      INFI131
  620 FORMAT(10X,F10.4,5X,F10.4,9X,F10.4,9X,F10.4,//)                        INFI132
  630 FORMAT('0',20X,'APPORTIONED INFILTRATION'//,10X,'ELEMENT NO.',5X,      INFI133
     1'QINFIL(CFS)',15X,'OPNFIL'//)                                          INFI134
  640 FORMAT(' ',10X,I5,12X,F10.3,11X,F8.4)                                  INFI135
  660 FORMAT(' ',215)                                                        INFI136
      RETURN                                                                 INFI137
      END                                                                    INFI138
```

```
      SUBROUTINE INITAL                                                  INIT  1
C     ROUTINE INITIALIZES FLOWS, AREAS, AND CONCENTRATIONS TO VALUES     INIT  2
C        CORRESPONDING TO DRY WEATHER FLOW PLUS INFILTRATION.            INIT  3
C     WHEN THERE ARE NO INITIAL VALUES OF DWF OR INFIL, VALUES REMAIN 0. INIT  4
      COMMON/TABLES/KDEPTH(25),KLASS(25),PSIMAX(15),ALFMAX(15),          INIT  5
     1              NN(25),MM(25),ANORM(15,51),QNORM(15,51),            INIT  6
     2              DNORM(15,51),AFACT(15),RFACT(15)                    INIT  7
      COMMON/CRWF/ CVDWF(7),DVBCD(7),DVSS(7),HVDWF(24),HVBOD(24),        INIT  8
     1             HVSS(24),HVCOLI(24),KTNUM,KDAY,KHOUR,KMINS          INIT  9
      COMMON A(160,2,2) ,Q(160,2,2) , CPOLL(160,2,2,3), QMAX(160),       INIT 10
     1       QFULL(160), AFULL(160), DXDT(160),C1(160), SLOPE(160),      INIT 11
     2       DIST(160), GEOM1(160), ROUGH(160), NDE(160), NUE(160,3),    INIT 12
     3       INUE(160,3), NTYPE(160), JR(160), NKLASS, NE, NDT, EPSIL,   INIT 13
     4       TIME, DT, M, KFULL, N, NOS, NPOLL, NPRINT, ITER,            INIT 14
     5       QDWF(160), IOLD(160), P1(160), RNOFF(160), QINFIL(160),     INIT 15
     6       WDWF(160,3), PLUTO(160,3), IR(160), P2(160), NIN(1000),     INIT 16
     7       P5(160),P6(160),P7(160),SCF(160),BARREL(160),               INIT 17
     8       TITLE(40), NPE(20), NYN(20), NORDER(70), GEOM2(160),        INIT 18
     9       GEOM3(160) , P4(160),SCOUR(160), KSTORE(160)                INIT 19
      COMMON  BODIN( 2,150),SSIN( 2,150),BODOUT,SSOUT,COLIN(2,150),      INIT 20X
     *  QINST,COLST,CINSTL( 2),QOUSTL( 2),STORL( 2),QOUTO( 2),STORO( 2),INIT 21
     *  NSTOR,KSTOR,IPRINT( 2),IPOL( 2),IFLOOD( 2),ICOST( 2),DEPMAX( 2),INIT 22
     *  ATERM( 2,11),AO2DT2( 2,11),BDEPTH( 2,11),BSTOR( 2,11),COLOUT,    INIT 23X
     *  DUMSTR(11),DUMDEP(11),                                           INIT 24
     *  KTSTEP,VOLIN( 2,150),VOLOUT( 2,150),STOR,CUMIN( 2),CUMOUT( 2),   INIT 25
     *  SBOD( 2),SSS( 2),SCOL( 2),                                       INIT 26X
     *  ISTMOD( 2),ISTTYP( 2),ISTOUT( 2),                                INIT 27
     *  QPUMP( 2),DSTART( 2),DSTOP( 2),                                  INIT 28
     *  DTON( 2),STORMX( 2),DTPUMP( 2),DTMORE( 2),STORF( 2),APLAN( 2),   INIT 29
     *  CLAND( 2),CSTOR( 2),CPS( 2),CTOTAL( 2),CPCUYD( 2),CPACRE( 2),    INIT 30
     *  LP,JP,LPREV( 2),LABEL,DETENT(150),FRAC(150),OUT1(10,200)         INIT 31X
      DIMENSION SUM2(6),QO(160),QI(160),QO1(160),QO2(160)                INIT 32
      EQUIVALENCE (QO1(1),QMAX(1)),(QO2(1),QFULL(1))                     INIT 33
      EQUIVALENCE (QO(1),Q(1,2,2)),(QI(1),Q(1,1,2))                      INIT 34
      WRITE (6,900)                                                      INIT 35
      WRITE (6,902)                                                      INIT 36
      DO 100 I=1,NE                                                      INIT 37
      M = JR(I)                                                          INIT 38
C     SUM UPSTREAM FLOWS AND POLLUTANT INFLOWS.                          INIT 39
      SUM1 = 0.0                                                         INIT 40
      DO 10 K=1,NPOLL                                                    INIT 41
   10 SUM2(K) = 0.0                                                      INIT 42
      DO 20 J=1,3                                                        INIT 43
      L=INUE(M,J)                                                        INIT 44
      NTU=NTYPE(L)                                                       INIT 45
      IF(NTU.LE.17.OR.NTU.GE.23) GO TO 18                                INIT 46
      KK=GEOM3(L)                                                        INIT 47
      QQ=QO2(L)                                                          INIT 48
      IF(NDE(M).EQ.KK)QQ=QO1(L)                                          INIT 49
      GO TO 19                                                           INIT 50
   18 QQ = Q(L,2,1)*BARREL(L)                                            INIT 51
   19 SUM1=SUM1+QQ                                                       INIT 52
      DO 20 K=1,NPOLL                                                    INIT 53
   20 SUM2(K)=SUM2(K)+CPOLL(L,2,1,K)*QQ                                  INIT 54
      SUM1 = SUM1+QINFIL(M)+QDWF(M)*DVDWF(KDAY)*HVDWF(KHOUR)             INIT 55
      Q(M,1,1) = SUM1/BARREL(M)                                          INIT 56
      Q(M,2,1) = Q(M,1,1)                                                INIT 57
      IF(Q(M,1,1).LT.0.0) Q(M,1,1)=0.0                                   INIT 58
      IF(Q(M,2,1).LT.0.0) Q(M,2,1) =0.0                                  INIT 59
      IF (SUM1.EQ.0.0) GO TO 40                                          INIT 60
```

```
      DO 30 K=1,NPOLL                                                    INIT 61
      IF(K.EQ.1) SUM2(K)=SUM2(K)+WDWF(M,K)*DVBUD(KDAY)*HVBUD(KHOUR)*     INIT 62
     *DVDWF(KDAY)*HVDWF(KHOUR)                                           INIT 63
      IF(K.EQ.2) SUM2(K)=SUM2(K)+WDWF(M,K)*DVSS(KDAY)*HVSS(KHOUR)*       INIT 64
     *DVDWF(KDAY)*HVDWF(KHOUR)                                           INIT 65
      IF (K.EQ.3) SUM2(K)=SUM2(K)+WDWF(M,K)*1.0*HVCOLI(KHOUR)*DVDWF(KDAYINIT 66
     *)*HVDWF(KHOUR)                                                     INIT 67
      CPOLL(M,1,1,K) = SUM2(K)/SUM1                                      INIT 68
   30 CPOLL(M,2,1,K) = CPOLL(M,1,1,K)                                    INIT 69
   40 NT = NTYPE(M)                                                      INIT 70
      IF (NT.EQ.22) GO TO 44                                             INIT 71
      IF(NT.LT.18.OR.NT.GT.22) GO TO 45                                  INIT 72
C     ASSUME ALL DWF IS NON-DIVERTED IN A FLOW DIVIDER TYPE ELEMENT.      INIT 73
      QO1(M)=SUM1                                                        INIT 74
      QO2(M)=0.0                                                         INIT 75
      GO TO 45                                                           INIT 76
   44 QO1(M) = 0.0                                                       INIT 77
      QO2(M) = SUM1                                                      INIT 78
   45 IF (KLASS(NT).EQ.3) GO TO 100                                      INIT 79
C     DETERMINE INITIAL FLOW AREA FOR CONDUITS.                          INIT 80
      PS = Q(M,1,1)/QFULL(M)                                             INIT 81
      CALL FINDA(PS,A(M,1,1))                                            INIT 82
      A(M,2,1) = A(M,1,1)                                                INIT 83
  100 WRITE (6,901) NOE(M),NT,SUM1,A(M,1,1),(CPOLL(M,1,1,K),K=1,NPOLL)  INIT 84
  900 FORMAT ('1ELEMENT FLOWS, AREAS, AND CONCENTRATIONS ARE INITIALIZEDINIT 85
     1 TO DRY WEATHER FLOW AND INFILTRATION VALUES.')                    INIT 86
  901 FORMAT(I6,I8,2F8.3,2FE.4,3X,1PE8.2,0P3F11.4)                       INIT 87
  902 FORMAT (' ELE.NO.  TYPE  FLOW    AREA   CONC1   CONC2      CONC3  INIT 88
     1    CONC4      CONC5      CONC6')                                  INIT 89
      RETURN                                                             INIT 90
      END                                                                INIT 91
```

```
      SUBROUTINE NEWTON(ALPHA,PS,C11,C2,KFLAG)                          NEWT  1
C     NEWTON-RAPHSON ITERATION ASSUMING FUNCTIONAL FORM FOR Q-A CURVE.  NEWT  2
      DIMENSION CI(160),QD(160)                                         NEWT  3
      COMMON/TABLES/KDEPTH(25),KLASS(25),PSIMAX(15),ALFMAX(15),         NEWT  4
     1              NN(25),MM(25),ANORM(15,51),QNORM(15,51),           NEWT  5
     2              DNORM(15,51),AFACT(15),RFACT(15)                   NEWT  6
      COMMON A(160,2,2) ,Q(160,2,2) , CPOLL(160,2,2,3), QMAX(160),      NEWT  7
     1       CFULL(160), AFULL(160), DXDT(160),C1(160), SLOPE(160),     NEWT  8
     2       DIST(160), GEOM1(160), ROUGH(160), NOE(160), NUE(160,3),   NEWT  9
     3       IAUE(160,3), NTYPE(160), JR(160), NKLASS, NE, NDT, EPSIL,  NEWT 10
     4       TIME, DT, M, KFULL, N, NOS, NPOLL, NPRINT, ITER,           NEWT 11
     5       QDWF(160), IOLD(160), P1(160), RNOFF(160), QINFIL(160),    NEWT 12
     6       WDWF(160,3), PLUTO(160,3), IR(160), P2(160), NIN(1000),    NEWT 13
     7       P5(160),P6(160),P7(160),SCF(160),BARREL(160),              NEWT 14
     8       TITLE(40), NPE(20), NYN(20), NORDER(70), GEOM2(160),       NEWT 15
     9       GEOM3(160) , P4(160),SCOUR(160), KSTORE(160)               NEWT 16
      COMMON  BODIN( 2,150),SSIN( 2,150),BODOUT,SSOUT,COLIN(2,150),     NEWT 17X
     *  QINST,COLST,QINSTL( 2),QOUSTL( 2),STORL( 2),QOUTO( 2),STORO( 2),NEWT 18
     *  NSTOR,KSTOR,IPRINT( 2),IPOL( 2),IFLOOD( 2),ICOST( 2),DEPMAX( 2),NEWT 19
     *  ATERM( 2,11),AO2DT2( 2,11),BDEPTH( 2,11),BSTOR( 2,11),COLOUT,    NEWT 20X
     *  DUMSTR(11),DUMDEP(11),                                          NEWT 21
     *  KTSTEP,VOLIN( 2,150),VOLOUT( 2,150),STOR,CUMIN( 2),CUMOUT( 2),  NEWT 22
     *  SBOD( 2),SSS( 2),SCOL( 2),                                      NEWT 23X
     *  ISTMCD( 2),ISTTYP( 2),ISTOUT( 2),                               NEWT 24
     *  QPUMP( 2),DSTART( 2),DSTOP( 2),                                 NEWT 25
     *  DTON( 2),STORMX( 2),DTPUMP( 2),DTMORE( 2),STORF( 2),APLAN( 2),  NEWT 26
     *  CLAND( 2),CSTOR( 2),CPS( 2),CTOTAL( 2),CPCOYD( 2),CPACRE( 2),   NEWT 27
     *  LP,JP,LPREV( 2),LABEL,DETENT(150),FRAC(150),OUT1(10,200)        NEWT 28X
      EQUIVALENCE (CC(1),Q(1,2,2)),(QI(1),Q(1,1,2))                     NEWT 29
C     FIRST GUESS FOR ALPHA ASSIGNED IN CALLING PROGRAM.                NEWT 30
      KFLAG = 1                                                         NEWT 31
      HELP = 0.0                                                        NEWT 32
      ICHK = 0                                                          NEWT 33
      I = 0                                                             NEWT 34
   10 I=I+1                                                             NEWT 35
      PS = PSI(ALPHA)                                                   NEWT 36
      D=(PS+C11*ALPHA+C2)/(DPSI(ALPHA)+C11)                             NEWT 37
      IF (ABS(D).LE.EPSIL) GO TO 20                                     NEWT 38
      ALPHA = ALPHA-D                                                   NEWT 39
      IF (ALPHA.LT.0.0.OR.ALPHA.GT.1.0.OR.ICHK.EQ.1) GO TO 15           NEWT 40
      IF (I.LE.20) GO TO 10                                             NEWT 41
      ALPHA = ALPHA+D/2.0                                               NEWT 42
      ICHK = 1                                                          NEWT 43
      GO TO 10                                                          NEWT 44
C     IF NEED BE, ASSIGN NEW VALUES TO ALPHA BY MARCHING ALONG ABSCISSA.NEWT 45
   15 ALPHA = HELP                                                      NEWT 46
      HELP = HELP+0.05                                                  NEWT 47
      I = 0                                                             NEWT 48
      ICHK = 0                                                          NEWT 49
      IF (HELP.LE.1.05) GO TO 10                                        NEWT 50
C     ITERATION DOES NOT CONVERGE. RETURN TO MAIN FOR ERROR MESSAGE.    NEWT 51
      KFLAG = 2                                                         NEWT 52
      RETURN                                                            NEWT 53
   20 IF (ALPHA.GE.0.0.AND.ALPHA.LE.1.0) RETURN                         NEWT 54
      GO TO 15                                                          NEWT 55
      END                                                               NEWT 56
```

```
      SUBROUTINE  PRINT                                                      PRIN  1
C                                                                            PRIN  2
C********THIS IS A NEW SUBROUTINE WHICH WILL REPLACE THE OLD PRINT          PRIN  3
C         WHICH EXISTED AT THE TIME OF THE MARCH MEETING                     PRIN  4
C                                                                            PRIN  5
      COMMON /TAPES/ INCNT,ICUTCT,JIN(10),JOUT(10),NSCRAT(5)                 PRIN  6
      COMMON A(160,2,2) ,Q(160,2,2) , CPOLL(160,2,2,3), QMAX(160),           PRIN  6A
     1       CFULL(160), AFULL(160), DXDT(160),C1(160), SLOPE(160),          PRIN  6B
     2       DIST(160), GEOM1(160), ROUGH(160), NOE(160), NUE(160,3),        PRIN  6C
     3       INUE(160,3), NTYPE(160), JR(160), NKLASS, NE, NDT, EPSIL,       PRIN  6D
     4       TIME, DT, M, KFULL, N, NOS, NPOLL, NPRINT, ITER,                PRIN  6E
     5       QCWF(160), IOLD(160), P1(160), RNOFF(160), QINFIL(160),         PRIN  6F
     6       WCWF(160,3), PLUTO(160,3), IR(160), P2(160), NIN(1000),         PRIN  6G
     7       P5(160),P6(160),P7(160),SCF(160),BARREL(160),                   PRIN  6H
     8       TITLE(40), NPE(20), NYN(20), NORDER(70), GEOM2(160),            PRIN  6I
     9       GEOM3(160) , P4(160),SCOUR(160), KSTORE(160)                    PRIN  6J
      COMMON  BODIN( 2,150),SSIN( 2,150),BODOUT,SSOUT,COLIN(2,150),          PRIN  6K
     *  QINST,CCLST,QINSTL( 2),QOUSTL( 2),STORL( 2),QOUTO( 2),STORO( 2),PRIN  6L
     *  NSTOR,KSTCR,IPRINT( 2),IPOL( 2),IFLOOD( 2),ICOST( 2),DEPMAX( 2),PRIN  6M
     *  ATERM( 2,11),AO2DT2( 2,11),BDEPTH( 2,11),BSTOR( 2,11),COLOUT,      PRIN  6N
     *  DUMSTR(11),CUMDEP(11),                                             PRIN  6O
     *  KTSTEP,VOLIN( 2,150),VOLOUT( 2,150),STOR,CUMIN( 2),CUMOUT( 2),     PRIN  6P
     *  SBOD( 2),SSS( 2),SCOL( 2),                                         PRIN  6Q
     *  ISTMOD( 2),ISTTYP( 2),ISTOUT( 2),                                  PRIN  6R
     *  QPUMP( 2),DSTART( 2),DSTOP( 2),                                    PRIN  6S
     *  DTON( 2),STORMX( 2),DTPUMP( 2),DTMORE( 2),STORF( 2),APLAN( 2),     PRIN  5T
     *  CLAND( 2),CSTOR( 2),CPS( 2),CTOTAL( 2),CPCUYD( 2),CPACRE( 2),      PRIN  6U
     *  LP,JP,LPREV( 2),LABEL,DETENT(150),FRAC(150),OUT1(10,200)           PRIN  6V
      COMMON /XX/  OUT2(10,200,4),PP(4)                                      PRIN  7X
      II=0                                                                   PRIN  8
    5 II=II+1                                                                PRIN  9
      NTX=NSCRAT(II)                                                         PRIN 10
      REWIND NTX                                                             PRIN 11
      DO 10 J=1, 10                                                          PRIN 12
      NYN(J)=0                                                               PRIN 13
      DO 10 N=1,200                                                          PRIN 14
      OUT1(J,N)=0.0                                                          PRIN 15
      DO 10 I=1,4                                                            PRIN 16
      OUT2(J,N,I)=0.0                                                        PRIN 17
      PP(I)=0.0                                                              PRIN 18
   10 CONTINUE                                                               PRIN 19
      READ(NTX) NDT,NNYN,NPOLL,NNPE,DT,JPRINT,JPLOT                          PRIN 20
      READ(NTX)(NYN(I),I=1,NNYN)                                             PRIN 21
  900 FORMAT(10I5)                                                           PRIN 22
      DO 20 N=1,NDT                                                          PRIN 23
      DO 20 J=1,NNYN                                                         PRIN 24
      READ(NTX) QQ,(PP(I),I=1,NPOLL)                                         PRIN 25X
      OUT1(J,N)=QQ                                                           PRIN 26X
      DO 15  JJ=1,NPOLL                                                      PRIN 27
   15 OUT2(J,N,JJ)=PP(JJ)                                                    PRIN 28
   20 CONTINUE                                                               PRIN 29
      IF(II.GT.1) GO TO 29                                                   PRIN 30
C         PRINT INFLOWS                                                      PRIN 30A
      WRITE(6,921)                                                           PRIN 31
      WRITE(6,911)(I,I=1,10)                                                 PRIN 32
      DO 216 I= 1,NNYN                                                       PRIN 33
  216 WRITE(6,912) NYN(I),(OUT1(I,J),J=1,NDT)                                PRIN 34
      WRITE(6,922)                                                           PRIN 35
      WRITE(6,911)(I,I=1,10)                                                 PRIN 36
      DO 217 I=1,NNYN                                                        PRIN 37
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      DO 217 IP=1,NPOLL                                                 PRIN 38
      GO TO (30,32,36,34), IP                                           PRIN 39
   30 WRITE(6,960)                                                      PRIN 40
      GO TO 160                                                         PRIN 41
   32 WRITE(6,961)                                                      PRIN 42
      GO TO 160                                                         PRIN 43
   34 WRITE(6,962)                                                      PRIN 44
      GO TO 160                                                         PRIN 45
   36 WRITE(6,963)                                                      PRIN 46
  160 CONTINUE                                                          PRIN 47
      IF(IP.NE.3)WRITE(6,912) NYN(I),(OUT2(I,J,IP),J=1,NDT)             PRIN 48
      IF(IP.EQ.3)WRITE(6,967) NYN(I),(OUT2(I,J,IP),J=1,NDT)             PRIN 49
  217 CONTINUE                                                          PRIN 50
      IF(II.LE.1) GO TO 5                                               PRIN 51
C          PRINT OUTFLOWS                                               PRIN 51A
   29 WRITE(6,923)                                                      PRIN 52
      WRITE(6,911)(I,I=1,10)                                            PRIN 53
      DO 218 I=1,NNPE                                                   PRIN 54
  218 WRITE(6,912) NYN(I),(OUT1(I,J),J=1,NDT)                           PRIN 55C
  300 WRITE(6,924)                                                      PRIN 67C
      WRITE(6,911)(I,I=1,10)                                            PRIN 63
      DO 219 I=1,NNPE                                                   PRIN 69
      DO 219 IP=1,NPOLL                                                 PRIN 70
      GO TO (40,42,46,44),IP                                            PRIN 71
   40 WRITE(6,960)                                                      PRIN 72
      GO TO 161                                                         PRIN 73
   42 WRITE(6,961)                                                      PRIN 74
      GO TO 161                                                         PRIN 75
   44 WRITE(6,962)                                                      PRIN 76
      GO TO 161                                                         PRIN 77
   46 WRITE(6,963)                                                      PRIN 78
  161 CONTINUE                                                          PRIN 79
      IF(IP.NE.3) WRITE(6,912) NYN(I),(OUT2(I,J,IP),J=1,NDT)            PRIN 80
      IF(IP.EQ.3) WRITE(6,967) NYN(I),(OUT2(I,J,IP),J=1,NDT)            PRIN 81
  219 CONTINUE                                                          PRIN 82
C     FIND TOTAL OUTPUT OF SS AND BOD IN POUNDS                         PRIN 83
      TSSOUT=0.0                                                        PRIN 84
      TBODOT=0.0                                                        PRIN 85
      DO 1000 J=1,NDT                                                   PRIN 86
      TSSOUT=TSSOUT+OUT2(NNPE,J,2)*DT/60.                               PRIN 87
      TBODOT=TBODOT+OUT2(NNPE,J,1)*DT/60.                               PRIN 88
 1000 CONTINUE                                                          PRIN 89C
      WRITE(6,964)                                                      PRIN104C
      WRITE(6,911)(I,I=1,10)                                            PRIN105
      DO 236 I=1,NNPE                                                   PRIN106
      DO 236 IP=1,NPOLL                                                 PRIN107
      GO TO (50,52,56,54),IP                                            PRIN108
   50 WRITE(6,968)                                                      PRIN109
      GO TO 234                                                         PRIN110
   52 WRITE(6,969)                                                      PRIN111
      GO TO 234                                                         PRIN112
   54 WRITE(6,962)                                                      PRIN113
      GO TO 234                                                         PRIN114
   56 CONTINUE                                                          PRIN115
      IF(IP.EQ.3) WRITE(6,966)                                          PRIN116
  234 CONTINUE                                                          PRIN117
      DO 235 J=1,NDT                                                    PRIN118
      IF(OUT1(I,J).EQ.0.0) GO TO 237                                    PRIN119
      IF(IP.NE.3) OUT2(I,J,IP)=OUT2(I,J,IP)*267.5/OUT1(I,J)             PRIN120
      IF(IP.EQ.3) OUT2(I,J,IP)=OUT2(I,J,IP)/(OUT1(I,J)*17040.0)         PRIN121
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```
      GO TO 238                                                          PRIN122
  237 OUT2(I,J,IP)=0.0                                                   PRIN123
  238 CONTINUE                                                           PRIN124
  235 CONTINUE                                                           PRIN125
      IF(IP.NE.3) WRITE(6,912)NYN(I),(OUT2(I,J,IP),J=1,NDT)              PRIN126
      IF(IP.EQ.3) WRITE (6,967)NYN(I),(OUT2(I,J,IP),J=1,NDT)             PRIN127
  236 CONTINUE                                                           PRIN128
      WRITE(06,965) NYN(NNPE),TSSOUT,NYN(NNPE),TBODOT                    PRIN129
  965 FORMAT('1'/'0',5X,'TOTAL POUNDS OF SUSPENDED SOLIDS OUTPUT FROM EL PRIN130
     *EMENT ',I4,' =',F10.2//' ',5X,'TOTAL POUNDS OF FIVE-DAY BOD OUTPUT PRIN131
     * FROM ELEMENT ',I4,' =',F10.2////)                                 PRIN132
  311 RETURN                                                             PRIN133
  964 FORMAT(//42X,'SELECTED OUTFLOW POLLUTOGRAPHS                ')     PRIN134
  911 FORMAT(' EXTERNAL'/' ELEMENT    TIME STEP'/' NUMBER',3X,10(I6,4X)) PRIN135
  912 FORMAT (/I6,4X,10F10.3,/,(10X,10F10.3))                            PRIN136
  921 FORMAT(//43X,'SELECTED INLET HYDROGRAPHS - CFS')                   PRIN137
  922 FORMAT(//43X,'SELECTED INLET POLLUTOGRAPHS                ')       PRIN138
  923 FORMAT(//42X,'SELECTED OUTFLOW HYDROGRAPHS - CFS')                 PRIN139
  924 FORMAT(//42X,'SELECTED OUTFLOW POLLUTOGRAPHS                ')     PRIN140
  955 FORMAT('0',40X,'POLLUTANT',I5)                                     PRIN141
  960 FORMAT('0',40X,'*** BOD IN LBS/MIN ***')                           PRIN142
  961 FORMAT('0',40X,'** SUSPENDED SOLIDS IN LBS/MIN **')                PRIN143
  962 FORMAT('0',40X,'*** DO ***')                                       PRIN144
  963 FORMAT('0',40X,'*** COLIFORM IN MPN/MIN ***')                      PRIN145
  966 FORMAT('0',40X,'***COLIFORM IN MPN/100ML ***')                     PRIN146
  967 FORMAT(/I6,4X,1P10E10.2,/,(10X,10E10.2))                           PRIN147
  968 FORMAT('0',40X,'*** BOD IN MG/L ****')                             PRIN148
  969 FORMAT('0',40X,'*** SUSPENDED SOLIDS IN MG/L ***')                 PRIN149
      END                                                                PRIN150
```

```
      FUNCTION PSI(ALPHA)                                                PSI   1
C     FINDS Q/QFULL (PSI) GIVEN A/AFULL (ALPHA) FOR FUNCTIONAL Q-A CURVEPSI   2
      COMMON /PSICPS/ AA,AB,D1,D2,AAA,CATH,ALF,I,R                       PSI   3
      COMMON/TABLES/KDEPTH(25),KLASS(25),PSIMAX(15),ALFMAX(15),          PSI   4
     1              NN(25),MM(25),ANORM(15,51),QNORM(15,51),            PSI   5
     2              DNORM(15,51),AFACT(15),RFACT(15)                    PSI   6
      COMMON A(160,2,2) ,Q(160,2,2) , QFULL(160,2,2,3), QMAX(160),       PSI   7
     1       QFULL(160), AFULL(160), DXDT(160),C1(160), SLOPE(160),      PSI   8
     2       DIST(160), GEOM1(160), ROUGH(160), NOE(160), NUE(160,3),    PSI   9
     3       IAUE(160,3), NTYPE(160), JR(160), NKLASS, NE, NDT, EPSIL,   PSI  10
     4       TIME, DT, M, KFULL, N, NDS, NPOLL, NPRINT, ITER,            PSI  11
     5       QCHF(160), IOLD(160), P1(160), RNOFF(160), QINFIL(160),     PSI  12
     6       HLWF(160,3), PLOTO(160,3), JR(160), P2(160), NIN(1000),     PSI  13
     7       P5(160),P6(160),P7(160),SCF(160),BARREL(160),               PSI  14
     8       TITLE(40), NPE(20), NYN(20), NORDER(70), GEOM2(160),        PSI  15
     9       GEOM3(160) , P4(160),SCOUR(160), KSTORE(160)                PSI  16
      COMMON  BODIN( 2,150),SSIN( 2,150),BUDOUT,SSOUT,COLIN(2,150),      PSI  17X
     *  QINST,COLST,QINSTL( 2),QOUSTL( 2),STORL( 2),QOUTO( 2),STORO( 2),PSI  18
     *  NSTOR,KSTOR,IPRINT( 2),IPOL( 2),IFLOOD( 2),ICOST( 2),DEPMAX( 2),PSI  19
     *  ATERM( 2,11),AD2DT2( 2,11),BDEPTH( 2,11),BSTOR( 2,11),COLOUT,     PSI  20X
     *  DUMSTR(11),DUMDEP(11),                                           PSI  21
     *  KTSTEP,VOLIN( 2,150),VOLOUT( 2,150),STOR,CUMIN( 2),CUMOUT( 2),   PSI  22
     *  SBOD( 2),SSS( 2),SCOL( 2),                                       PSI  23X
     *  ISTMOD( 2),ISTTYP( 2),ISTOUT( 2),                                PSI  24
     *  QPUMP( 2),DSTART( 2),DSTOP( 2),                                  PSI  25
     *  DTON( 2),STORMX( 2),DTPUMP( 2),DTMORE( 2),STORF( 2),APLAN( 2),   PSI  26
     *  CLANC( 2),CSTOR( 2),CPS( 2),CTOTAL( 2),CPCUYD( 2),CPACRE( 2),    PSI  27
     *  LP,JP,LPREV( 2),LABEL,DETENT(150),FRAC(150),OUT1(10,200)         PSI  28X
      PSI = 0.0                                                          PSI  29
      IF(ALPHA.LE.0.0) RETURN                                            PSI  30
      NT = NTYPE(M)                                                      PSI  31
      IF (NT.EQ.2) GO TO 20                                              PSI  32
      IF (NT.EQ.10) GO TO 100                                            PSI  33
      IF (NT.EQ.11) GO TO 110                                            PSI  34
      IF (NT.EQ.12) GO TO 120                                            PSI  35
C     INCLUDE TABULAR PSI CALC. IN CASE PSI IS CALLED BY KLASS=2 CONDUITPSI  35
      DALPHA = ANORM(NT,2)-ANORM(NT,1)                                   PSI  37
      I = ALPHA/DALPHA+1.0                                               PSI  38
      PSI = QNORM(NT,I)+(QNORM(NT,I+1)-QNORM(NT,I))/DALPHA*(ALPHA-       PSI  39
     1 ANORM(NT,I))                                                      PSI  40
      RETURN                                                             PSI  41
C     SPECIAL FUNCTIONAL FORM FOR RECTANGULAR CONDUITS.                  PSI  42
   20 R = P5(M)                                                          PSI  43
      IF (ALPHA.GT.ALFMAX(NT)) GO TO 25                                  PSI  44
      AAA = 2.0*R*ALPHA+1.0                                              PSI  45
      CATH = (ALPHA*P7(M)/AAA)**0.6666667                                PSI  46
      PSI = ALPHA*CATH                                                   PSI  47
      RETURN                                                             PSI  48
   25 PSI = P4(M)+(ALPHA-ALFMAX(NT))*(1.0-P4(M))/(1.0-ALFMAX(NT))        PSI  49
      RETURN                                                             PSI  50
C     FUNCTIONAL FORM FOR MODIFIED BASKET-HANDLE.                        PSI  51
  100 AA = ALPHA*AFULL(M)                                                PSI  52
      IF (AA.GT.GEOM3(M)) GO TO 105                                      PSI  53
      ALF = AA/GEOM3(M)                                                  PSI  54
      R = GEOM1(M)/GEOM2(M)                                              PSI  55
      AAA = 2.0*ALF*R+1.0                                                PSI  56
      CATH = (ALF*P7(M)/AAA)**0.6666667*P6(M)                            PSI  57
      PSI = ALF*CATH                                                     PSI  58
      RETURN                                                             PSI  59
  105 RH = RADH(AA)                                                      PSI  60
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      PSI = 1.49/ROUGH(M)*AA*RH**0.6666667/P1(M)                          PSI  61
      RETURN                                                             PSI  62
C     FUNCTIONAL FORM FOR RECTANGULAR, TRIANGULAR BOTTOM.                PSI  63
  110 AB = GEOM3(M)*GEOM2(M)/2.0                                         PSI  64
      AA = ALPHA*AFULL(M)                                                PSI  65
      IF (AA.GT.AB) GO TO 115                                            PSI  66
      PSI = P7(M)*ALPHA**1.333333                                        PSI  67
      RETURN                                                             PSI  68
  115 IF (ALPHA.GT.ALFMAX(NT)) GO TO 25                                  PSI  69
      AAA = GEOM3(M)/P5(M)-GEOM3(M)+(2.0*GEOM1(M)-GEOM3(M))*ALPHA        PSI  70
      CATH = (ALPHA*P6(M)/AAA)**0.6666667                                PSI  71
      PSI = ALPHA*CATH                                                   PSI  72
      RETURN                                                             PSI  73
C     FUNCTIONAL FORM FOR RECTANGULAR, ROUND BOTTOM.                     PSI  74
  120 AA = ALPHA*AFULL(M)                                                PSI  75
      IF (AA.GT.P6(M)) GO TO 125                                         PSI  76
      ALF = ALPHA*AFULL(M)/(3.1415965*GEOM3(M)*GEOM3(M))                 PSI  77
      I = ALF/0.02+1.0                                                   PSI  78
      PSI = QNORM(1,I)+(QNORM(1,I+1)-QNORM(1,I))/0.02*(ALF-ANORM(1,I))   PSI  79
      PSI = PSI*P7(M)                                                    PSI  80
      RETURN                                                             PSI  81
  125 IF (ALPHA.GT.ALFMAX(NT)) GO TO 25                                  PSI  82
      D1 = GEOM3(M)*P5(M)+2.0*GEOM1(M)+GEOM2(M)                          PSI  83
      D2 = GEOM3(M)*P5(M)+2.0/GEOM2(M)*(AFULL(M)*ALPHA-P6(M))            PSI  84
      CATH = (ALPHA*D1/D2)**0.6666667                                    PSI  85
      PSI = ALPHA*CATH                                                   PSI  86
      RETURN                                                             PSI  87
      END                                                                PSI  88
```

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      SUBROUTINE QUAL(DUMY2,DUMY3,DUMY4,DUMY5)                          QUAL   1
C     ROUTING SUBPROGRAM FOR POLLUTANTS MOVING THROUGH SEWER ELEMENTS   QUAL   2
C     COMPLETE MIXING ASSUMED IN ALL ELEMENTS SURFACE AND SUB-          QUAL   3
C     SURFACE INPUTS(PIPEFLOW,GROUNDWATER,SEWAGE, AND CATCHBASIN OUTFLOWQUAL   4
C      MIXING VOLUME IS THE DIFFERENTIATING FACTOR THAT AFFECTS QUALITY QUAL   5
C     CHANGE FROM ONE ELEMENT TO THE NEXT                               QUAL   6
      DIMENSION SURGE1(160),SURGE2(160),WELL1(160),WELL2(160)           QUAL   7
     1,QO(160),QI(160),QO1(160),QO2(160),PUMP(160)                      QUAL   8
      COMMON/TABLES/KDEPTH(25),KLASS(25),PSIMAX(15),ALFMAX(15),         QUAL   9
     1              AN(25),AM(25),ANORM(15,51),QNORM(15,51),            QUAL  10
     2              DNORM(15,51),AFACT(15),RFACT(15)                    QUAL  11
      COMMON A(160,2,2) ,Q(160,2,2) , CPOLL(160,2,2,3), QMAX(160),      QUAL  12
     1       QFULL(160), AFULL(160), DXDT(160),C1(160), SLOPE(160),     QUAL  13
     2       DIST(160), GEOM1(160), ROUGH(160), NOE(160), NUE(160,3),   QUAL  14
     3       IAUE(160,3), NTYPE(160), JR(160), NKLASS, NE, NDT, EPSIL,  QUAL  15
     4       TIME, DT, M, KFULL, N, NOS, NPOLL, NPRINT, ITER,           QUAL  16
     5       QDWF(160), IOLD(160), P1(160), RNOFF(160), QINFIL(160),    QUAL  17
     6       WDWF(160,3), PLUTO(160,3), IR(160), P2(160), NIN(1000),    QUAL  18
     7       P5(160),P6(160),P7(160),SCF(160),BARREL(160),              QUAL  19
     8       TITLE(40), NPE(20), NYN(20), NORDER(70), GEOM2(160),       QUAL  20
     9       GEOM3(160) , P4(160),SCOUR(160), KSTORE(160)               QUAL  21
      COMMON  BODIN( 2,150),SSIN( 2,150),BODOUT,SSOUT,COLIN(2,150),     QUAL 22X
     *  QINST,QOUST,QINSTL( 2),QOUSTL( 2),STORL( 2),QOUTO( 2),STORO( 2),QUAL  23
     *  NSTOR,KSTOR,IPRINT( 2),IPOL( 2),IFLOOD( 2),ICOST( 2),DEPMAX( 2),QUAL  24
     *  ATERM( 2,11),AO2DT2( 2,11),BDEPTH( 2,11),BSTOR( 2,11),COLOUT,   QUAL 25X
     *  DUMSTR(11),DUMDEP(11),                                          QUAL  26
     *  KTSTEP,VOLIN( 2,150),VOLOUT( 2,150),STOR,CUMIN( 2),CUMOUT( 2),  QUAL  27
     *  SBOD( 2),SSS( 2),SCCL( 2),                                      QUAL 28X
     *  ISTMOD( 2),ISTTYP( 2),ISTOUT( 2),                               QUAL  29
     *  QPUMP( 2),DSTART( 2),DSTOP( 2),                                 QUAL  30
     *  DTQN( 2),STORMX( 2),DTPUMP( 2),DTMORE( 2),STORF( 2),APLAN( 2),  QUAL  31
     *  CLAND( 2),CSTOR( 2),CPS( 2),CTOTAL( 2),CPCUYD( 2),CPACRE( 2),   QUAL  32
     *  LP,JP,LPREV( 2),LABEL,DETENT(150),FRAC(150),OUT1(10,200)        QUAL 33X
      EQUIVALENCE (PUMP(1),DIST(1)),(SURGE1(1),P1(1)),(SURGE2(1),P2(1)) QUAL  34
      EQUIVALENCE (QO1(1),QMAX(1)),(QO2(1),QFULL(1))                    QUAL  35
      EQUIVALENCE (QO(1),Q(1,2,2)),(QI(1),Q(1,1,2))                     QUAL  36
      EQUIVALENCE (WELL1(1),SLOPE(1)),(WELL2(1),ROUGH(1))               QUAL  37
      REAL KVAL                                                         QUAL  38
      P3=2./DT                                                          QUAL  39
      NT=NTYPE(M)                                                       QUAL  40
      GO TO(11C,110,110,110,110,11C,110,110,110,110,110,110,            QUAL  41
     1 110,110,110,120,130,12C,120,120,120,120,150), NT                 QUAL  42
C     PIPE***MIXING VOLUME FOUND BY AVERAGING UPSTREAM AND DOWNSTREAM   QUAL  43
C     FLOW AREAS AND BY MULTIPLYING BY LENGTH OF PIPE                   QUAL  44
  110 VOL1=DIST(M)*(A(M,1,1)+A(M,2,1))/2.0*BARREL(M)                    QUAL  45
      VOL2=DIST(M)*(A(M,1,2)+A(M,2,2))/2.0*BARREL(M)                    QUAL  46
      AREAF=(A(M,1,2)+A(M,2,2))/2.                                      QUAL  47
      RHYD=RADH(AREAF)                                                  QUAL  48
      GO TO 160                                                         QUAL  49
C     MANHOLE***MIXING VOLUME IS VOLUME CURRENTLY STORED AS SURCHARGING QUAL  50
  120 VOL1=SURGE1(M)                                                    QUAL  51
      VOL2=SURGE2(M)                                                    QUAL  52
      SURGE1(M)=SURGE2(M)                                               QUAL  53
      GO TO 160                                                         QUAL  54
C     LIFT STATION***MIXING VOLUME IS VOLUME CURRENTLY IN WET WELL      QUAL  55
  130 VOL1=WELL1(M)                                                     QUAL  56
      VOL2=WELL2(M)                                                     QUAL  57
      WELL1(M)= WELL2(M)                                                QUAL  58
      GO TO 160                                                         QUAL  59
C     ME FLOW CONTROL STRUCTURES***MIXING VOLUMES INITIALLY ZERO        QUAL  60
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  150 VOL1=0.0                                                                  QUAL  61
      VOL2=0.0                                                                  QUAL  62
C     QUALITY CONCENTRATIONS(LBS PER CU. FT.)***CPOLL(M,1,2)                    QUAL  63
C     POUNDS POLLUTANT IN SEWAGE                                                QUAL  64
  160 DO 172 IP=1, NPOLL                                                        QUAL  65
      TOTAL1=0.0                                                                QUAL  66
      DO 170 JP=1,3                                                             QUAL  67
      NNEED=INUE(M,JP)                                                          QUAL  68
      NTU=NTYPE(NNEED)                                                          QUAL  69
      IF(NTU.LE.17.OR.NTU.GE.23)GO TO 168                                       QUAL  70
      KK=GECM3(NNEED)                                                           QUAL  71
      QQ=QQ2(NNEED)                                                             QUAL  72
      IF(NOE(M).EQ.KK)QQ=QQ1(NNEED)                                             QUAL  73
      GO TO 170                                                                 QUAL  74
  168 QQ=Q(NNEED,2,2)                                                           QUAL  75
  170 TOTAL1=TOTAL1+CPOLL(NNEED,2,2,IP)*QQ                                      QUAL  76
      NNEED=IR(M)                                                               QUAL  77
      TOTAL3=PLUTO(NNEED,IP)                                                    QUAL  78
      GO TO(210,220,240,230),IP                                                 QUAL  79
C     PARAMETERS FOR B O D                                                      QUAL  80
  210 TOTAL2= DUMY2                                                             QUAL  81
C     THE NUMBER 0.2314815E-5 = 0.2/(24.0*60.0*60.0)                            QUAL  82
      D1 = 0.2314815E-5                                                         QUAL  83
      D2=0.C                                                                    QUAL  84
      S=0.0                                                                     QUAL  85
      GO TO 250                                                                 QUAL  86
C     PARAMETERS FOR S S                                                        QUAL  87
  220 TOTAL2=DUMY3                                                              QUAL  88
      D1=0.0                                                                    QUAL  89
      D2=0.0                                                                    QUAL  90
      S=0.0                                                                     QUAL  91
      IF(QI(M).LE.0.0) GO TO 250                                                QUAL  92
      IF(KLASS(NT).GT.2) GO TO 245                                              QUAL  93
      SPG=2.7                                                                   QUAL  94
      KVAL=.056                                                                 QUAL  95
C     DETERMINE CRITICAL DIAMETER OF SOLIDS FOR MOTION.                         QUAL  96
      CRITD=RHYD*SLOPE(M)/(KVAL*(SPG-1.0))                                      QUAL  97
      CRITD=CRITD*304.8                                                         QUAL  98
      IF(CRITD.LE..59) PCT1=-1.2471*CRITD+1.0                                   QUAL  99
      IF(CRITD.GT..59.AND.CRITD.LE.2.0) PCT1=-.1501*CRITD+.3527                 QUAL100
      IF(CRITD.GT.2.0.AND.CRITD.LE.10.0) PCT1=-.00656*CRITD+.0655               QUAL101
      IF(CRITD.GT.10.0) PCT1=0.0                                                QUAL102
      IF(CRITD.LE.0.0) PCT1=1.0                                                 QUAL103
      PCT2=PCT1                                                                 QUAL104
      SCOUR(M)=SCOUR(M)+PCT2*(TOTAL1+TOTAL2+TOTAL3)*DT                          QUAL105
      TOTAL4=(1.-PCT2)*(TOTAL1+TOTAL2+TOTAL3)+(1.-PCT1)*SCOUR(M)/DT             QUAL106
      CPOLL(M,1,2,2)=TOTAL4/QI(M)                                               QUAL107
      SCOUR(M)=PCT1*SCOUR(M)                                                    QUAL108
C     THE NUMBER 84.28 = 2.7*62.4/2.0                                           QUAL109
      ULIMIT=84.28*AFULL(M)*DIST(M)*BARREL(M)                                   QUAL110
      IF(SCOUR(M).GT.ULIMIT) GO TO 300                                          QUAL111
      GO TO 250                                                                 QUAL112
  300 CPOLL(M,1,2,2)=((SCOUR(M)-ULIMIT)/QI(M))/DT + CPOLL(M,1,2,2)              QUAL113
      SCOUR(M)=ULIMIT                                                           QUAL114
      GO TO 250                                                                 QUAL115
C     PARAMETERS FOR D O                                                        QUAL116
  230 TOTAL2=DUMY4                                                              QUAL117
C     THE NUMBER 0.2314815E-5 = 0.2/(24.0*60.0*60.0)                            QUAL118
C     THE NUMBER 0.3472222E-5 = 0.3/(24.0*60.0*60.0)                            QUAL119
C     THE NUMBER 0.4356716E-3 = 7.0*8.34/134000.0                               QUAL120
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      D1 = 0.2314815E-5                                                    QUAL121
      D2 = 0.3472222E-5                                                    QUAL122
      S = 0.4356716E-3                                                     QUAL123
      GO TO 250                                                            QUAL124
C     PARAMETERS FOR NONSETTLABLE, CONSERVATIVE POLLUTANT, (COLIFORM)      QUAL125
  240 TOTAL2=DUMY5                                                         QUAL126
      D1=0.0                                                               QUAL127
      D2=0.0                                                               QUAL128
      S=0.0                                                                QUAL129
      GO TO 250                                                            QUAL130
  245 IF(Q(M,1,2).LE.0.0001) GO TO 171                                     QUAL131
      CPOLL(M,1,2,IP)=(TOTAL1+TOTAL2+TOTAL3)/Q(M,1,2)                      QUAL132
  250 CONTINUE                                                             QUAL133
C     CONCENTRATION OF INFLOW TO ELEMENT                                   QUAL134
      IF(Q(M,1,2).LE.0.0001) GO TO 171                                     QUAL135
      IF(IP.NE.2) CPOLL(M,1,2,IP)=(TOTAL1+TOTAL2+TOTAL3)/Q(M,1,2)          QUAL136
C     CONCENTRATION OF OUTFLOW FROM ELEMENT                                QUAL137
  171 IF(Q(M,2,2).LE.0.0001) GO TO 172                                     QUAL138
      CPOLL(M,2,2,IP)=(CPOLL(M,2,1,IP)*(VOL1*(P3-D1-D2)-Q(M,2,1))+         QUAL139
     1CPOLL(M,1,1,IP)*Q(M,1,1)+CPOLL(M,1,2,IP)*Q(M,1,2)+D2*S*(VOL1         QUAL140
     2+VOL2))/(VOL2*(P3+D1+D2)+Q(M,2,2))                                   QUAL141
      IF(CPOLL(M,2,2,IP).LE.0.0) CPOLL(M,2,2,IP) =0.0                      QUAL142
  172 CONTINUE                                                             QUAL143
      RETURN                                                               QUAL144
      END                                                                  QUAL145
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      FUNCTION RADH(AA)                                                  RADH  1
C     FUNCTION TO COMPUTE THE HYDRAULIC RADIUS FOR A GIVEN FLOW AREA.    RADH  2
      COMMON/TABLES/KDEPTH(25),KLASS(25),PSIMAX(15),ALFMAX(15),          RADH  3
     1              NN(25),MM(25),ANORM(15,51),QNORM(15,51),            RADH  4
     2              DNORM(15,51),AFACT(15),RFACT(15)                    RADH  5
      COMMON A(160,2,2) ,Q(160,2,2) , CPOLL(160,2,2,3), QMAX(160),       RADH  6
     1       QFULL(160), AFULL(160), DXDT(160),C1(160), SLOPE(160),      RADH  7
     2       DIST(160), GEOM1(160), ROUGH(160), NOE(160), NUE(160,3),    RADH  8
     3       IAUE(160,3), NTYPE(160), JR(160), NKLASS, NE, NDT, EPSIL,   RADH  9
     4       TIME, DT, M, KFULL, N, NOS, NPULL, NPRINT, ITER,            RADH 10
     5       QDWF(160), IOLD(160), P1(160), RNOFF(160), QINFIL(160),     RADH 11
     6       HDWF(160,3), PLUTO(160,3), IR(160), P2(160), NIN(1000),     RADH 12
     7       P5(160),P6(160),P7(160),SCF(160),BARREL(160),               RADH 13
     8       TITLE(40), NPE(20), NYN(20), NORDER(70), GEOM2(160),        RADH 14
     9       GEOM3(160) , P4(160),SCCUR(160), KSTORE(160)                RADH 15
C     PARAMETERS NEEDED ARE:                                             RADH 16
C                                                                        RADH 17
C        AA= AREA OF FLOW FOR WHICH RADH IS TO BE CALCULATED             RADH 18
C                                                                        RADH 19
      REAL L1                                                            RADH 20
      NT=NTYPE(M)                                                        RADH 21
      AF=AFULL(M)                                                        RADH 22
      IF(AA.LE.0.0) GO TO 330                                            RADH 23
      GO TO (100,300,400,400,400,400,400,400,400,500,520,540,400,        RADH 24
     1 400,400,200,200,200,200,200,200,200,200,200,200), NT              RADH 25
C     CIRCULAR PIPE                                                      RADH 26
  100 DIAM=GEOM1(M)                                                      RADH 27
  105 ALPHA=AA/AF                                                        RADH 28
      DALPHA=ANORM(1,2)-ANORM(1,1)                                       RADH 29
      I=ALPHA/DALPHA +1.0                                                RADH 30
      D1=DNORM(1,I)+(ALPHA-ANORM(1,I))/DALPHA*(DNORM(1,I+1)-DNORM(1,I))  RADH 31
      D1=D1*DIAM                                                         RADH 32
      RR=DIAM/2.0                                                        RADH 33
      IF(D1-RR)  110,120,130                                             RADH 34
C     HERE IF FLOW IS BELOW HALF WAY MARK                                RADH 35
  110 D2=RR-D1                                                           RADH 36
      L1= SQRT(RR**2-D2**2)                                              RADH 37
      ARG=L1/D2                                                          RADH 38
      THETA=2.0*ATAN(ARG)                                                RADH 39
      S=RR*THETA                                                         RADH 40
      RADH=AA/S                                                          RADH 41
      RETURN                                                             RADH 42
C     HERE IF FLOW IS AT HALF WAY MARK                                   RADH 43
  120 RADH=AA/(3.14159*RR)                                               RADH 44
      RETURN                                                             RADH 45
C     HERE IF FLOW IS OVER HALF WAY MARK                                 RADH 46
  130 D2=D1-RR                                                           RADH 47
      L1= SQRT(RR**2-D2**2)                                              RADH 48
      THETA=2.0*ATAN2(L1,D2)                                             RADH 49
      S=RR*THETA                                                         RADH 50
      S= 2.0*3.14159*RR-S                                                RADH 51
      RADH=AA/S                                                          RADH 52
      RETURN                                                             RADH 53
C     NO CALCULATIONS FOR NON CONDUITS                                   RADH 54
  200 RADH=0.0                                                           RADH 55
      RETURN                                                             RADH 56
C     RECTANGULAR PIPE                                                   RADH 57
  300 XL=GEOM2(M)                                                        RADH 58
      DIAM=GEOM1(M)                                                      RADH 59
      RADH= AA/(XL+2.0*(AA/AF)*DIAM)                                     RADH 60
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      RETURN                                                            RADH 61
C     HERE IF NO FLOW IN PIPE                                           RADH 62
  330 RADH=0.0                                                          RADH 63
      RETURN                                                            RADH 64
C     ASSUME EQUIVALENT CIRCULAR PIPE FOR UDD SHAPES                    RADH 65
  400 DIAM=SQRT(4.0*AF/3.1417)                                          RADH 66
      GO TO 105                                                         RADH 67
C     HYDRAULIC RADIUS FOR MODIFIED BASKET HANDLE CONDUIT.              RADH 68
  500 DD = (GEOM1(M)+GEOM2(M)/2.0)*DEPTH(AA/AFULL(M))                   RADH 69
      IF (DD.GT.GEOM1(M)) GO TO 505                                     RADH 70
      RADH = AA/(GEOM2(M)+2.0*DD)                                       RADH 71
      RETURN                                                            RADH 72
  505 CATHY = DD-GEOM1(M)                                               RADH 73
      THETA = ARSIN(2.0*CATHY/GEOM2(M))                                 RADH 74
      PER = 2.0*GEOM1(M)+GEOM2(M)*(1.0+THETA)                           RADH 75
      RADH = AA/PER                                                     RADH 76
      RETURN                                                            RADH 77
C     HYDRAULIC RADIUS FOR RECTANGULAR, TRIANGULAR BOTTOM.              RADH 78
  520 DD = GEOM1(M)*DEPTH(AA/AFULL(M))                                  RADH 79
      IF (DD.GT.GEOM3(M)) GO TO 525                                     RADH 80
      PER = DD/P5(M)                                                    RADH 81
      RADH = AA/PER                                                     RADH 82
      RETURN                                                            RADH 83
  525 CATHY = DD-GEOM3(M)                                               RADH 84
      PER = 2.0*CATHY+GEOM3(M)/P5(M)                                    RADH 85
      RADH = AA/PER                                                     RADH 86
      RETURN                                                            RADH 87
C     HYDRAULIC RADIUS FOR RECTANGULAR, ROUND BOTTOM.                   RADH 88
  540 IF (AA.GT.P6(M)) GO TO 545                                        RADH 89
      DIAM = 2.0*GEOM3(M)                                               RADH 90
      AF = 3.141597*GEOM3(M)*GEOM3(M)                                   RADH 91
      GO TO 105                                                         RADH 92
  545 CATHY = AA-P6(M)                                                  RADH 93
      PER = 2.0*CATHY/GEOM2(M)+GEOM3(M)*P5(M)                           RADH 94
      RADH = AA/PER                                                     RADH 95
      RETURN                                                            RADH 96
      END                                                               RADH 97
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      SUBROUTINE RCUTE(NITER)                                              ROUT  1
C     ROUTING SUBPROGRAM FOR FLOW THROUGH SEWER ELEMENTS.                  ROUT  2
C     IN PROGRAM, ALPHA REPRESENTS NORMALIZED AREA, A/AFULL.               ROUT  3
C     IN PROGRAM, PSI AND PS REPRESENT NORMALIZED FLOW, Q/QFULL.           ROUT  4
      DIMENSION QI(160),QO(160),SURGE1(160),SURGE2(160),WELL1(160),        ROUT  5
     1 WELL2(160),PUMP(160),G(400),QO1(160),QO2(160)                       ROUT  6
      COMMON/TABLES/KDEPTH(25),KLASS(25),PSIMAX(15),ALFMAX(15),            ROUT  7
     1              NN(25),MM(25),ANORM(15,51),QNORM(15,51),               ROUT  8
     2              DNORM(15,51),AFACT(15),RFACT(15)                       ROUT  9
      COMMON/NAMES/ NAME(4,25),GNO,YES,BLANK                               ROUT 10
      COMMON A(160,2,2) ,Q(160,2,2) , CPOLL(160,2,2,3), QMAX(160),         ROUT 11
     1       QFULL(160), AFULL(160), DXDT(160),C1(160), SLOPE(160),        ROUT 12
     2       DIST(160), GEOM1(160), ROUGH(160), NDE(160), NUE(160,3),      ROUT 13
     3       INUE(160,3), NTYPE(160), JR(160), NKLASS, NE, NDT, EPSIL,     ROUT 14
     4       TIME, DT, M, KFULL, N, NOS, NPOLL, NPRINT, ITER,              ROUT 15
     5       QCHF(160), IOLD(160), P1(160), RNOFF(160), QINFIL(160),       ROUT 16
     6       HCHF(160,3), PLUTO(160,3), IR(160), P2(160), NIN(1000),       ROUT 17
     7       P5(160),P6(160),P7(160),SCF(160),BARREL(160),                 ROUT 18
     8       TITLE(40), NPE(20), NYH(20), NORDER(70), GEOM2(160),          ROUT 19
     9       GEOM3(160) , P4(160),SCOUR(160), KSTORE(160)                  ROUT 20
      COMMON  BOLIN( 2,150),SSIN( 2,150),BODOUT,SSOUT,COLIN(2,150),        ROUT 21X
     *  QINST,COLST,QINSTL( 2),QOUSTL( 2),STORL( 2),QOUTO( 2),STURO( 2),  ROUT 22
     *  NSTOR,KSTOR,IPRINT( 2),IPOL( 2),IFLOOD( 2),ICOST( 2),DEPMAX( 2),  ROUT 23
     *  ATERM( 2,11),AO2DT2( 2,11),BDEPTH( 2,11),BSTOR( 2,11),COLOUT,     ROUT 24X
     *  DUMSTR(11),DUMDEP(11),                                            ROUT 25
     *  KTSTEP,VOLIN( 2,150),VOLOUT( 2,150),STOR,CUMIN( 2),CUMOUT( 2),    ROUT 26
     *  SBOD( 2),SSS( 2),SCCL( 2),                                        ROUT 27X
     *  ISTMOD( 2),ISTTYP( 2),ISTOUT( 2),                                 ROUT 28
     *  QPUMP( 2),DSTART( 2),DSTOP( 2),                                   ROUT 29
     *  DTGN( 2),STORMX( 2),DTPUMP( 2),DTMORE( 2),STORF( 2),APLAN( 2),    ROUT 30
     *  CLAND( 2),CSTOR( 2),CPS( 2),CTOTAL( 2),CPCUYD( 2),CPACRE( 2),     ROUT 31
     *  LP,JP,LPREV( 2),LABEL,DETENT(150),FRAC(150),OUT1(10,200)          ROUT 32X
      EQUIVALENCE (QO(1),Q(1,2,2)),(QI(1),Q(1,1,2))                        ROUT 33
      EQUIVALENCE (PUMP(1),DIST(1)),(SURGE1(1),P1(1)),(SURGE2(1),P2(1))    ROUT 34
      EQUIVALENCE (QO1(1),QMAX(1)),(QO2(1),QFULL(1))                       ROUT 35
      EQUIVALENCE (WELL1(1),SLOPE(1)),(WELL2(1),ROUGH(1))                  ROUT 36
      DATA WT/0.55/,WD/0.55/                                               ROUT 37
C     USE GENERALIZED WEIGHTS OF TIME AND SPACE DERIVATIVES OF             ROUT 38
C     CONTINUITY EQUATION.                                                 ROUT 39
C     WT=WEIGHT ON TIME DERIVATIVE.                                        ROUT 40
C     WD=WEIGHT ON SPATIAL DERIVATIVE.                                     ROUT 41
C     THESE CONSTANTS APPEAR IN DEFINITIONS OF C1(M) AND C2.               ROUT 42
C     NOTE, WT=WD=0.5 CORRESPOND TO ORIGINAL VERSION OF TRANSPORT MODEL.   ROUT 43
C     WT=WD=0.55 APPEAR TO GIVE BEST ATTENUATION OF HYDROGRAPHS.           ROUT 44
      NT = NTYPE(M)                                                        ROUT 45
C     M = ELEMENT NUMBER                                                   ROUT 46
C     KLASS(NT)=1 FOR CONDUIT WITH FUNCTIONAL Q-A RELATIONSHIP.            ROUT 47
C     KLASS(NT)=2 FOR CONDUIT WITH TABULAR Q-A RELATIONSHIP.               ROUT 48
C     KLASS(NT)=3 FOR ELEMENT OTHER THAN CONDUIT.                          ROUT 49
      K = KLASS(NT)                                                        ROUT 50
      GO TO (5,5,200), K                                                   ROUT 51
C     COMPUTE TOTAL HEAD SLOPE AND ASSOCIATED PARAMETERS.                  ROUT 52
C     KFULL=1 IF CONDUIT IS FULL AT UPSTREAM END.                          ROUT 53
C     KFULL=2 IF CONDUIT IS NOT FULL AT UPSTREAM END.                      ROUT 54
    5 IF (KFULL.EQ.1) GO TO 10                                             ROUT 55
      IF (SCF(M).EQ.GNO) GO TO 6                                           ROUT 56
C     NO ITERATIONS REQUIRED FOR CONDUITS WITH SUPER-CRITICAL FLOW.        ROUT 57
      ITER = 0                                                             ROUT 58
      GO TO (20,100), K                                                    ROUT 59
    6 IF(ITER.GT.NITER) GO TO 7                                            ROUT 60
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      QOLD=QFULL(M)                                                     ROUT 61
      A1 = A(M,1,1)/AFULL(M)                                            ROUT 62
      A2 = A(M,2,1)/AFULL(M)                                            ROUT 63
      DV =  (VEL(Q(M,1,1),A(M,1,1))**2- VEL(Q(M,2,1),A(M,2,1))**2)/     ROUT 64
     1DIST(M)/64.4                                                      ROUT 65
      WSLOPE = SLOPE(M)+P2(M)*(DEPTH(A1)-DEPTH(A2))+DV                  ROUT 66
      GO TO 9                                                           ROUT 67
    7 A1 = A(M,1,2)/AFULL(M)                                            ROUT 68
      A2 = A(M,2,2)/AFULL(M)                                            ROUT 69
      DV =  (VEL(Q(M,1,2),A(M,1,2))**2- VEL(Q(M,2,2),A(M,2,2))**2)/     ROUT 70
     1DIST(M)/64.4                                                      ROUT 71
      WSLOPE = SLOPE(M)+P2(M)*(DEPTH(A1)-DEPTH(A2))+DV                  ROUT 72
    9 IF (WSLOPE.LT.SLOPE(M)) WSLOPE = SLOPE(M)                         ROUT 73
    8 QFULL(M) = P1(M)*SQRT(WSLOPE)                                     ROUT 74
      DELQ=ABS(QFULL(M)-QOLD)                                           ROUT 75
      IF(DELQ.LT..00002*QFULL(M)) ITER=0                                ROUT 76
      QFULL(M)=QOLD+(QFULL(M)-QOLD)/2.                                  ROUT 77
      QOLD=QFULL(M)                                                     ROUT 78
      IF (ITER-NITER.GE.NITER-1) ITER=0                                 ROUT 79
   10 C1(M) = AFULL(M)/QFULL(M)*DXDT(M)*WT/WD                           ROUT 80
      QMAX(M) = P4(M)*QFULL(M)                                          ROUT 81
      GO TO (20,100), K                                                 ROUT 82
C     ROUTINE FOR CONDUIT WITH FUNCTIONAL Q-A RELATIONSHIP.             ROUT 83
C     FIND NEW UPSTREAM AREA.                                           ROUT 84
   20 GO TO (25,30), KFULL                                              ROUT 85
   25 A(M,1,2)=AFULL(M)                                                 ROUT 86
      GO TO 40                                                          ROUT 87
   30 C2 = -Q(M,1,2)/QFULL(M)                                           ROUT 88
      ALPHA = A(M,1,1)/AFULL(M)                                         ROUT 89
      CALL NEWTON(ALPHA,PS,0.0,C2,KFLAG)                                ROUT 90
      IF (KFLAG.NE.2) GO TO 35                                          ROUT 91
      WRITE (6,910) TIME,N,NOE(M),A(M,1,1)                              ROUT 92
      ALPHA = A(M,1,1)/AFULL(M)                                         ROUT 93
   35 A(M,1,2) = ALPHA*AFULL(M)                                         ROUT 94
C     ASSIGN VALUES TO CONSTANTS AND SOLVE FOR DOWNSTREAM Q AND A.      ROUT 95
   40 C2 = (1.0-WC)*Q(M,2,1)-(1.0-WD)*Q(M,1,1)-WD*Q(M,1,2)              ROUT 96
      C2 = C2+DXDT(M)*((1.0-WT)*A(M,1,2)-(1.0-WT)*A(M,1,1)-WT*A(M,2,1)) ROUT 97
      C2 = C2/QFULL(M)/WD                                               ROUT 98
      ALPHA = A(M,2,1)/AFULL(M)                                         ROUT 99
      CALL NEWTON(ALPHA,PS,C1(M),C2,KFLAG)                              ROUT100
      GO TO (45,50),KFLAG                                               ROUT101
C     DOWNSTREAM Q AND A MAY NOW BE CALCULATED.                         ROUT102
   45 A(M,2,2) = ALPHA*AFULL(M)                                         ROUT103
      Q(M,2,2) = PS*QFULL(M)                                            ROUT104
      RETURN                                                            ROUT105
C     DETERMINE REASON FOR NON-CONVERGENCE.                             ROUT106
C     THEN USE DEFAULT OPTIONS TO DETERMINE Q AND A.                    ROUT107
   50 IF(NPRINT.LT.1) GO TO 52                                          ROUT108
      WRITE (6,900)                                                     ROUT109
      WRITE(6,901) TIME,M,QFULL(M),AFULL(M),DXDT(M),Q(M,1,1),Q(M,1,2),  ROUT110
     1Q(M,2,1),A(M,1,1),A(M,1,2),A(M,2,1),ALPHA                         ROUT111
C     SEE IF LINE-C1*ALPHA-C2 INTERSECTS Q-A CURVE.                     ROUT112
   52 IF ((-C1(M)*ALFMAX(NT)-C2).GT.P4(M)) GO TO 60                     ROUT113
      IF(C2.GT.0) GO TO 65                                              ROUT114
C     REASON FOR NON-CONVERGENCE UNDETERMINED.                          ROUT115
C     LET NEW Q AND A EQUAL VALUES AT PREVIOUS TIME STEP.               ROUT116
      IF (NPRINT.GE.1) WRITE (6,902)                                    ROUT117
      A(M,2,2) = A(M,2,1)                                               ROUT118
      Q(M,2,2) = Q(M,2,1)                                               ROUT119
      RETURN                                                            ROUT120
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C     CONTINUITY EQUATION TRIES TO FORCE Q.GT.QMAX.                    ROUT121
C     LET DOWNSTREAM FLOW BE QFULL UNLESS UPSTREAM Q IS GT QFULL.      ROUT122
   60 IF (NPRINT.GE.1) WRITE (6,903)                                   ROUT123
      IF(Q(M,1,2).GT.QFULL(M)) GO TO 75                                ROUT124
      Q(M,2,2) = QFULL(M)                                              ROUT125
      A(M,2,2) = AFULL(M)                                              ROUT126
      RETURN                                                           ROUT127
C     CONTINUITY EQUATION TRIES TO FORCE Q. LT. ZERO.                  ROUT128
C     LET DOWNSTREAM FLOW BE ZERO.                                     ROUT129
   65 IF (NPRINT.GE.1) WRITE (6,904)                                   ROUT130
      Q(M,2,2) = 0.0                                                   ROUT131
      A(M,2,2)=0.0                                                     ROUT132
      RETURN                                                           ROUT133
   75 Q(M,2,2) = Q(M,1,2)                                              ROUT134
      A(M,2,2) = A(M,1,2)                                              ROUT135
      RETURN                                                           ROUT136
C     ROUTINE FOR CONDUIT WITH TABULAR Q-A RELATIONSHIP.               ROUT137
  100 DALPHA = ANORM(NT,2)-ANORM(NT,1)                                 ROUT138
      MMM = MM(NT)                                                     ROUT139
C     CALCULATE UPSTREAM AREA.                                         ROUT140
      GO TO (102,105),KFULL                                            ROUT141
  102 A(M,1,2) = AFULL(M)                                              ROUT142
      GO TO 115                                                        ROUT143
  105 PS = Q(M,1,2)/QFULL(M)                                           ROUT144
      CALL FINDA(PS,A(M,1,2))                                          ROUT145
C     CALCULATE DOWNSTREAM Q AND A.                                    ROUT146
  115 ISIGN = 1                                                        ROUT147
      IF (A(M,1,2).LT.A(M,1,1)) ISIGN = -1                             ROUT148
      ICHK = 1                                                         ROUT149
      I =IOLD(M)                                                       ROUT150
      C2 = (1.0-WD)*Q(M,2,1)-(1.0-WC)*Q(M,1,1)-WD*Q(M,1,2)             ROUT151
      C2 = C2+DXDT(M)*((1.0-WT)*A(M,1,2)-(1.0-WT)*A(M,1,1)-WT*A(M,2,1)) ROUT152
      C2 = C2/QFULL(M)/WD                                              ROUT153
C     CALCULATE SLOPE OF LINE SEGMENT I OF Q-A CURVE.                  ROUT154
  120 SLUPE=(QNORM(NT,I+1)-QNORM(NT,I))/DALPHA                         ROUT155
      IF(SLUPE+C1(M).EQ.0.0) GO TO 130                                 ROUT156
C     COMPUTE ALPHA CORRESPONDING TO INTERSECTION OF LINE SEGMENT I OF ROUT157
C        Q-A CURVE WITH LINE -C1*ALPHA-C2.                             ROUT158
      ALPHA=(-QNORM(NT,I)-C2+SLUPE*ANORM(NT,I))/(SLUPE+C1(M))          ROUT159
C     CHECK TO SEE IF ALPHA IS IN PROPER RANGE.                        ROUT160
      IF (ALPHA.GT.1.0.OR.ALPHA.LT.0) GO TO 125                        ROUT161
      L=  (ALPHA/DALPHA) + 1.0                                         ROUT162
      PS = QNORM(NT,L)+(ALPHA-ANORM(NT,L))/DALPHA *(QNORM(NT,L+1)      ROUT163
     1-QNORM(NT,L))                                                    ROUT164
      IF(ABS(PS+C1(M)*ALPHA+C2).LE.EPSIL) GO TO 150                    ROUT165
C     TRY NEXT LINE SEGMENT.                                           ROUT166
  125 I = I+ISIGN                                                      ROUT167
  126 IF (I.GT.0.AND.I.LT.MMM) GO TO 120                               ROUT168
      GO TO  (127,50),ICHK                                             ROUT169
C     IF I HAS REACHED ZERO OR MMM START AT IOLD AND GO OTHER WAY      ROUT170
  127 ISIGN = -ISIGN                                                   ROUT171
      I = IOLD(M)+ISIGN                                                ROUT172
      ICHK = 2                                                         ROUT173
      GO TO 126                                                        ROUT174
C     LINE-C1*ALPHA-C2 AND LINE SEGMENT ARE PARALLEL.                  ROUT175
C     CHECK TO SEE IF THEY ARE CO-LINEAR.                              ROUT176
  130 IF(ABS(C2+QNORM(NT,I)-SLUPE*ANORM(NT,I)).GT.EPSIL) GO TO 125     ROUT177
      ALPHA = ANORM(NT,I)+DALPHA/2.0                                   ROUT178
      L=  (ALPHA/DALPHA) + 1.0                                         ROUT179
      PS = QNORM(NT,L)+(ALPHA-ANORM(NT,L))/DALPHA *(QNORM(NT,L+1)      ROUT180
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     1-GNORM(AT,L))                                                    ROUT181
  150 A(M,2,2) = ALPHA*AFULL(M)                                        ROUT182
      Q(M,2,2) = PS*QFULL(M)                                           ROUT183
      RETURN                                                           ROUT184
C     ELEMENT IS NOT A CONDUIT.                                        ROUT185
  200 NGOTO = AT-15                                                    ROUT186
      IF (NGOTO.LT.1) GO TO 210                                        ROUT187
      GO TO (220,230,250,400,500,250,520,220,220,220), NGOTO           ROUT188
C     ERROR***CONDUITS SHOULD BE KLASS 1 OR 2                          ROUT189
  210 QO(M)=QI(M)                                                      ROUT190
      WRITE (6,905) M                                                  ROUT191
      RETURN                                                           ROUT192
C     MANHOLE *** SIMPLY TRANSLATE FLOW WITH NO TIME DELAY             ROUT193
  220 QO(M)=QI(M)                                                      ROUT194
      RETURN                                                           ROUT195
C     LIFT STATION***PUMPS ASSUMED TO BE PUMPING AT CONSTANT RATE      ROUT196
C     (=PUMP(M)).                                                      ROUT197
C      VOLUME IN WET WELL INITIALLY IS HALF THE CAPACITY(GEOM1).       ROUT198
C     FORCE MAIN ASSUMED TO REMAIN FULL AT ALL TIMES RESULTING IN NO   ROUT199
C     TIME DELAY.                                                      ROUT200
  230 WELL2(M) = WELL2(M)+QI(M)*DT                                     ROUT201
      IF (WELL2(M)-GEOM1(M))233,234,234                                ROUT202
  233 QO(M) = 0.0                                                      ROUT203
      RETURN                                                           ROUT204
  234 IF (WELL2(M).GE.PUMP(M)*DT) GO TO 236                            ROUT205
      QO(M) = WELL2(M)/DT                                              ROUT206
      WELL2(M) = 0.0                                                   ROUT207
      RETURN                                                           ROUT208
  236 QO(M) = PUMP(M)                                                  ROUT209
      WELL2(M) = WELL2(M)-PUMP(M)*DT                                   ROUT210
      RETURN                                                           ROUT211
C     ROUTINE FOR TYPE 18 AND TYPE 21 FLOW DIVIDERS.                   ROUT212
C     TYPE 18 MAY BE USED FOR A SIMPLE OVERFLOW STRUCTURE.             ROUT213
C     TYPE 21 MAY BE USED WITH A CUNNETTE SECTION DOWNSTREAM.          ROUT214
  250 QO(M) = QI(M)                                                    ROUT215
      IF (QI(M).GT.GEOM1(M)) GO TO 255                                 ROUT216
      QO1(M) = QI(M)                                                   ROUT217
      QO2(M) = 0.0                                                     ROUT218
      RETURN                                                           ROUT219
  255 QO1(M) = GEOM1(M)                                                ROUT220
      QO2(M) = QI(M)-GEOM1(M)                                          ROUT221
      RETURN                                                           ROUT222
C     STORAGE UNIT. ADAPTED FROM M&E ROUTINE.                          ROUT223
  400   KSTOR = KSTORE(M)                                            ROUT224
      IF (IFLOOD(KSTOR) .EQ. 1)  GO TO 450                             ROUT225
        KTSTEP= N                                                      ROUT226
        QINST = QI(M)                                                  ROUT227
      DO 420 IP=1,NPOLL                                                ROUT228
        CPOLL(M,1,2,IP)=0.0                                            ROUT229
      IF(QI(M).LE.0.0) GO TO 420                                       ROUT230
      DO 415 J=1,3                                                     ROUT231
      NNEED = INDE(M,J)                                                ROUT232
      NTU = ATYPE(NNEED)                                               ROUT233
      IF (NTU.LE.17.OR.NTU.GE.23) GO TO 413                            ROUT234
      L = GEOM3(NNEED)                                                 ROUT235
      CC = CC2(NNEED)                                                  ROUT236
      IF (NDE(M).EQ.L) CC=QO1(NNEED)                                   ROUT237
      GO TO 415                                                        ROUT238
  413 QQ = CC(NNEED)                                                   ROUT239
  415 CPOLL(M,1,2,IP) = CPOLL(M,1,2,IP)+CPOLL(NNEED,2,2,IP)*QQ         ROUT240
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      CPOLL(M,1,2,IP) = CPOLL(M,1,2,IP)/QI(M)                          ROUT241
  420 CONTINUE                                                         ROUT242
        BODIN(KSTOR,KTSTEP) = CPOLL(M,1,2,1)*QI(M)*DT                  ROUT243
        SSIN( KSTOR,KTSTEP) = CPOLL(M,1,2,2)*QI(M)*DT                  ROUT244
        COLIN(KSTOR,KTSTEP) = CPOLL(M,1,2,3)*QI(M)*DT                  ROUT244A
      CALL TSTORG                                                      ROUT245
      IF (ISTOUT(KSTOR).NE.9) CO2(M)=QOUST                             ROUT246
        QO(M) = QOUST                                                  ROUT247
      IF(QC(M).GT.0.0) GO TO 440                                       ROUT248
      CPOLL(M,2,2,1)=0.0                                               ROUT249
      CPOLL(M,2,2,2)=0.0                                               ROUT250
      CPOLL(M,2,2,3)=0.0                                               ROUT250A
      GO TO 450                                                        ROUT251
  440   CPOLL(M,2,2,1) = BODOUT/(QO(M)*DT)                             ROUT252
        CPOLL(M,2,2,2) =  SSOUT/(QO(M)*DT)                            ROUT253
        CPOLL(M,2,2,3) = COLOUT/(QO(M)*DT)                             ROUT253A
  450 RETURN                                                           ROUT254
C     ROUTINE FOR TYPE 20 FLOW DIVIDER.                                ROUT255
C     USE WITH SIDE WEIR OR OTHER WEIR TYPE DIVERSION.                 ROUT256
C     DIST=MAX FLOW WITHOUT FLOW OVER WEIR.                            ROUT257
C     SLOPE=MAXIMUM FLOW THROUGH WHOLE STRUCTURE.                      ROUT258
C     ROUGH=WEIR CONSTANT TIMES WEIR LENGTH.                           ROUT259
C     GEOM1 = WEIR HEIGHT.                                             ROUT260
C     GEOM2 = DEPTH IN STRUCTURE AT TIME OF MAXIMUM FLOW.              ROUT261
C     GEOM3 = DOWNSTREAM EXT. ELE. NUM. INTO WHICH GOES UNDIVERTED FLOW.ROUT262
C     FLOW OVER WEIR IS THE DIVERTED FLOW.                             ROUT263
  500 QO(M) = QI(M)                                                    ROUT264
      IF (QI(M).GT.DIST(M)) GO TO 505                                  ROUT265
      QO2(M) = 0.0                                                     ROUT266
      QO1(M) = QI(M)                                                   ROUT267
      RETURN                                                           ROUT268
  505 DH = (QI(M)-DIST(M))/(SLOPE(M)-DIST(M))*(GEOM2(M)-GEOM1(M))      ROUT269
      QO2(M) = ROUGH(M)*DH*SQRT(DH)                                    ROUT270
      QO1(M) = QI(M)-QO2(M)                                            ROUT271
      RETURN                                                           ROUT272
C     ROUTINE FOR BACKWATER ELEMENT.                                   ROUT273
C     ELEMENT ACTS AS FLOW DIVIDER.                                    ROUT274
C     GEOM3=ELEMENT NUMBER OF DOWNSTREAM STORAGE UNIT.                 ROUT275
  520 QO(M) = QI(M)                                                    ROUT276
      L = GEOM3(M)                                                     ROUT277
      L = MIN(L)                                                       ROUT278
      KSTOR = KSTORE(L)                                                ROUT279
C     IF BACKWATER EXTENDS ALL THE WAY UP TO ELEMENT,                  ROUT280
C     THEN WHOLE FLOW IS DIVERTED TO STORAGE ELEMENT.                  ROUT281
C     ASSUME LENGTH OF BACKWATER IS PROPORTIONAL TO SQRT OF STORAGE    ROUT282
C     VOLUME.                                                          ROUT283
      QO1(M) = QI(M)*SQRT(STORL(KSTOR)/BSTOR(KSTOR,11))                ROUT284
      QO2(M) = QI(M)-QO1(M)                                            ROUT285
      RETURN                                                           ROUT286
  900 FORMAT (/' ITERATION FOR DOWNSTREAM FLOW HAS NOT CONVERGED.'/    ROUT287
     13X'TIME  ELEMENT  QFULL  AFULL  DXDT  Q(M,1,1) Q(M,1,2) Q(M,2,1) AROUT288
     2(M,1,1) A(M,1,2) A(M,2,1) ALPHA')                                ROUT289
  901 FORMAT (F8.1,I6,F9.1,F7.2,F7.1,3F9.2,3F9.3,F7.3)                 ROUT290
  902 FORMAT (' REASON FOR NON-CONVERGENCE UNDETERMINED. USE Q,A VALUES ROUT291
     1AT PREVIOUS TIME STEP.'//)                                       ROUT292
  903 FORMAT (' CONTINUITY EQN TRIES TO FORCE Q.GT.QMAX. USE QFULL UNLESROUT293
     1S UPSTREAM Q.GT.QFULL - THEN USE UPSTREAM VALUE.')               ROUT294
  904 FORMAT (' CONTINUITY EQN TRIES TO FORCE Q.LT.ZERO. USE ZERO.')   ROUT295
  905 FORMAT (/' ERROR: CONDUITS SHOULD BE CLASS 1 OR 2. M='I5)        ROUT296
  910 FORMAT (/' **WARNING: NEWTON UNABLE TO FIND AREA GIVEN FLOW. TIME=ROUT297
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1'F7.1,', TIME STEP='I3,', EXT. ELE. NUM.='I4,', USE OLD UPSTREAM AROUT298
2REA='F6.2)                                                        ROUT299
 END                                                               ROUT300
```

```
      SUBROUTINE SLOP                                                    SLOP  2
C     ROUTINE TO SEQUENCE ELEMENTS FOR COMPUTATION.                      SLOP  3
C     THIS VERSION OF SLOP USES VECTOR 'NIN' TO POINT TO INTERNAL NUMBERSLOP  4
C     EXTERNAL ELEMENT NUMBERS MUST BE NUMERIC AND LE 1000.              SLOP  5
      COMMON/NAMES/ NAME(4,25),GNO,YES,BLANK                             SLOP  6
      COMMON/TABLES/KDEPTH(25),KLASS(25),PSIMAX(15),ALFMAX(15),          SLOP  7
     1              NN(25),MM(25),ANORM(15,51),QNORM(15,51),            SLOP  8
     2              DNORM(15,51),AFACT(15),RFACT(15)                    SLOP  9
      COMMON A(160,2,2) ,Q(160,2,2) , CPOLL(160,2,2,3), QMAX(160),       SLOP 10
     1       QFULL(160), AFULL(160), DXDT(160),C1(160), SLOPE(160),      SLOP 11
     2       DIST(160), GEOM1(160), ROUGH(160), NOE(160), NUE(160,3),    SLOP 12
     3       INUE(160,3), NTYPE(160), JR(160), NKLASS, NE, NDT, EPSIL,   SLOP 13
     4       TIME, DT, H, KFULL, N, NUS, NFULL, NPRINT, ITER,            SLOP 14
     5       QDWF(160), IOLD(160), P1(160), RNOFF(160), QINFIL(160),     SLOP 15
     6       WDWF(160,3), PLUTO(160,3), IR(160), P2(160), NIN(1000),     SLOP 16
     7       P5(160),P6(160),P7(160),SCF(160),BARREL(160),               SLOP 17
     8       TITLE(40), NPE(20), NYN(20), NORDER(70), GEOM2(160),        SLOP 18
     9       GEOM3(160) , P4(160),SCOUR(160), KSTORE(160)                SLOP 19
      COMMON  BQCIN( 2,150),SSIN( 2,150),BQOUT,SSOUT,QUL IN(2,150),      SLOP 20X
     *  QINST,QOLST,QINSTL( 2),QOUSTL( 2),STORL( 2),QOUTO( 2),STORO( 2),SLOP 21
     *  NSTOR,KSTOR,IPRINT( 2),IPOL( 2),IFLOOD( 2),ICOST( 2),DEPMAX( 2),SLOP 22
     *  ATERM( 2,11),AQ2DT2( 2,11),BDEPTH( 2,11),BSTOR( 2,11),COLOJT,    SLOP 23X
     *  DUMSTR(11),DUMDEP(11),                                           SLOP 24
     *  KTSTEP,VOLIN( 2,150),VOLOUT( 2,150),STOR,CUMIN( 2),CUMOUT( 2),   SLOP 25
     *  SBQB( 2),SSS( 2),SCQL( 2),                                       SLOP 26X
     *  ISTMQC( 2),ISTTYP( 2),ISTOUT( 2),                                SLOP 27
     *  QPUMP( 2),DSTART( 2),DSTOP( 2),                                  SLOP 28
     *  DTCN( 2),STORMX( 2),DTPUMP( 2),DTMORE( 2),STORF( 2),APLAN( 2),   SLOP 29
     *  CLAND( 2),CSTOR( 2),CPS( 2),CTOTAL( 2),CPCUYD( 2),CPACRE( 2),    SLOP 30
     *  LP,JP,LPREV( 2),LABEL,DETENT(150),FRAC(150),OUT1(10,200)         SLOP 31X
      NEP1 = NE+1                                                        SLOP 32
C     ZERO OUT ARRAYS                                                    SLOP 33
      DO 10 I=1,NE                                                       SLOP 34
      IR(I) = 0                                                          SLOP 35
   10 JR(I) = 0                                                          SLOP 36
C     COMPUTE INTERNAL UPSTREAM ELEMENT NUMBERS.                         SLOP 37
      DO 15 N=1,NE                                                       SLOP 38
      DO 15 J=1,3                                                        SLOP 39
      IF (NUE(N,J)) 12,12,13                                             SLOP 40
C     IF THERE IS NO UPSTREAM ELEMENT, ASSIGN ARTIFICIAL VALUE.          SLOP 41
   12 INUE(N,J) = NEP1                                                   SLOP 42
      GO TO 15                                                           SLOP 43
   13 L = NUE(N,J)                                                       SLOP 44
C     UPSTREAM ELEMENT NUMBERS NOW FOUND FROM POINTING VECTOR, 'NIN'.    SLOP 45
      INUE(N,J) = NIN(L)                                                 SLOP 46
   15 CONTINUE                                                           SLOP 47
C     SEQUENCE ELEMENTS FOR COMPUTATION.                                 SLOP 48
C     FLOW MAY BE ROUTED IN ELEMENT I IF IT HAS BEEN ROUTED IN ALL       SLOP 49
C        UPSTREAM ELEMENTS.                                              SLOP 50
      DO 30 N=1,NE                                                       SLOP 51
      I = 1                                                              SLOP 52
   17 IF(IR(I)) 20,20,18                                                 SLOP 53
   18 I = I+1                                                            SLOP 54
      IF (I-NE) 17,17,30                                                 SLOP 55
   20 DO 25 J=1,3                                                        SLOP 56
      IF (NUE(I,J)) 25,25,22                                             SLOP 57
   22 L = INUE(I,J)                                                      SLOP 58
      IF (IR(L)) 18,18,25                                                SLOP 59
   25 CONTINUE                                                           SLOP 60
      IR(I) = 1                                                          SLOP 61
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      JR(N) = I                                                          SLOP 62
   30 CONTINUE                                                           SLOP 63
      WRITE (6,905)                                                      SLOP 64
      DO 50 I=1,NE                                                       SLOP 65
      L = JR(I)                                                          SLOP 66
      NT = NTYPE(I)                                                      SLOP 67
   50 WRITE (6,906) NOE(I),NT,(NAME(J,NT),J=1,4),(NUE(I,J),J=1,3),I,     SLOP 68
     1NOE(L),L,(INUE(L,J),J=1,3)                                         SLOP 69
      RETURN                                                             SLOP 70
  905 FORMAT ('0EXTERNAL  TYPE  DESCRIPTION      UPSTREAM ELEMENTS  INTERSLOP 71
     1NAL'10X,'ELEMENT COMPUTATION SEQUENCE'/' ELEMENT'29X,'1     2     3 SLOP 72
     2   ELEMENT'9X,'EXTERNAL  INTERNAL  INTERNAL UPSTREAM'/' NUMBER'    SLOP 73
     3 45X,'NUMBER'10X,'NUMBER     NUMBER     ELEMENT NUMBERS')         SLOP 74
  906 FORMAT (16,18,3X,4A4,3I5,I9,I16,I10,I9,2I5)                        SLOP 75
      END                                                                SLOP 76
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      FUNCTION VEL(QQ,AA)                                              VEL   1
C     ROUTINE TO COMPUTE VELOCITY GIVEN FLOW AND AREA.                 VEL   2
      IF (AA.LE.0.0001) GO TO 10                                       VEL   3
      VEL = QQ/AA                                                      VEL   4
      RETURN                                                           VEL   5
   10 VEL = 0.0                                                        VEL   6
      RETURN                                                           VEL   7
      END                                                              VEL   8
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C********METCALF & EDDY, ENGINEERS' STORAGE MODEL**********************TSTR  1
      SUBROUTINE TSTRCT                                                  TSTR  2
      COMMON/TABLES/KDEPTH(25),KLASS(25),PSIMAX(15),ALFMAX(15),          TSTR  3
     1              NN(25),MM(25),ANORM(15,51),QNORM(15,51),            TSTR  4
     2              DNORM(15,51),AFACT(15),RFACT(15)                    TSTR  5
      COMMON A(160,2,2) ,Q(160,2,2) , CPOLL(160,2,2,3), QMAX(160),       TSTR  6X
     1       CFULL(160), AFULL(160), DXDT(160),C1(160), SLOPE(160),      TSTR  7
     2       DIST(160), GEOM1(160), ROUGH(160), NOE(160), NUE(160,3),    TSTR  8
     3       INUE(160,3), NTYPE(160), JR(160), NKLASS, NE, NDT, EPSIL,   TSTR  9
     4       TIME, DT, M, KFULL, N, NOS, NPOLL, NPRINT, ITER,            TSTR 10
     5       CONF(160), IOLD(160), P1(160), RNOFF(160), QINFIL(160),     TSTR 11
     6       WDWF(160,3), PLUTO(160,3), IR(160), P2(160), NIN(1000),     TSTR 12X
     7       P5(160),P6(160),PT(160),SCF(160),DAKREL(160),               TSTR 13
     8       TITLE(40), NPE(20), NYN(20), NORDER(70), GEOM2(160),        TSTR 14X
     9       GEOM3(160) , P4(160),SCOUR(160), KSTORE(160)                TSTR 15
      COMMON  BODIN( 2,150),SSIN( 2,150),BODOUT,SSOUT,COLIN(2,150),      TSTR 16X
     *  QINST,CCUST,CINSTL( 2),QOUSTL( 2),STORL( 2),QOUTO( 2),STORO( 2),TSTR 17
     *  NSTOR,KSTOR,IPRINT( 2),IPOL( 2),IFLOOD( 2),ICOST( 2),DEPMAX( 2),TSTR 18
     *  ATERM( 2,11),AO2DT2( 2,11),BDEPTH( 2,11),BSTOR( 2,11),COLOUT,    TSTR 19X
     *  DUMSTR(11),DUMDEP(11),                                           TSTR 20
     *  KTSTEP,VOLIN( 2,150),VOLOUT( 2,150),STOR,CUMIN( 2),CUMOUT( 2),   TSTR 21
     *  SBOD( 2),SSS( 2),SCOL( 2),                                       TSTR 22X
     *  ISTMOD( 2),ISTTYP( 2),ISTOUT( 2),                                TSTR 23
     *  QPUMP( 2),DSTART( 2),DSTOP( 2),                                  TSTR 24
     *  DTON( 2),STORMX( 2),DTPUMP( 2),DTMORE( 2),STORF( 2),APLAN( 2),   TSTR 25
     *  CLAND( 2),CSTOR( 2),CPS( 2),CTOTAL( 2),CPCUYD( 2),CPACRE( 2),    TSTR 26
     *  LP,JP,LPREV( 2),LABEL,DETENT(150),FRAC(150),OUT1(10,200)         TSTR 27X
C                                                                        TSTR 28X
      DIMENSION  ADEPTH(11),AASURF(11),NUED(3)                           TSTR 29
      DIMENSION CO1(150),CO2(150)                                        TSTR 30
      EQUIVALENCE (QO1(1),QMAX(1)),(QO2(1),QFULL(1))                     TSTR 31
10000 IF ( NSTOR .EQ. 0)  STOP 10000                                     TSTR 32
C                                                                        TSTR 33
11111 DO 8888  KSTOR=1, NSTOR                                            TSTR 34
      WRITE(6,601)  KSTOR                                                TSTR 35
  601 FORMAT('1',//, 'OINPUT DATA FOR STORAGE  UNIT NO.', I3, ' FOLLOWS'TSTR 36
     *)                                                                  TSTR 37
      READ(5,501)  ISTMOD(KSTOR), ISTTYP(KSTOR), ISTOUT(KSTOR)          TSTR 39X
  501 FORMAT(1015)                                                       TSTR 40
C                                                                        TSTR 41
C                    NOTE..   OPERATIONAL OPTIONS INDICATED BY '*'       TSTR 42
C                                                                        TSTR 43
C                    KSTOR  = STORAGE  UNIT NO.                          TSTR 44
C                    NOED   = NO. OF ELEMENT                             TSTR 45
C                    NUED   = NO. OF UPSTREAM ELEMENT                    TSTR 46
C                                                                        TSTR 47
C                    ISTMOD = STORAGE  MODE (ROUTING, HOLDING, ETC)      TSTR 48
C                *           = 1 = IN-LINE                               TSTR 49
C                            = 2 = OFF-LINE                              TSTR 50
C                            = 3 = INTRASYSTEM                           TSTR 51
C                            = 4 = REROUTING                             TSTR 52
C                    ISTTYP = STORAGE  STRUCTURE (NATURAL, TANK, BAG)    TSTR 53
C                *           = 1 = IRREGULAR (NATURAL) RESERVOIR         TSTR 54
C                *           = 2 = GEOMETRIC (REGULAR) RESERVOIR - COVEREDTSTR 55
C                *           = 3 = GEOMETRIC (REGULAR) RESERVOIR - UNCOVERTSTR 56
C                            = 4 = INTRASYSTEM                           TSTR 57
C                            = 5 = RUBBER BAG                            TSTR 58
C-EXCLUDED           ISTEXS = EXCESS FLOW HANDLING (BYPASS, BACK-UP, FLOUTSTR 59
C-EXCLUDED                  = 1 = BYPASS FRACTION CONTINUOUSLY, UNDER GRATSTR 60
C-EXCLUDED                  = 2 = BYPASS FRACTION CONTINUOUSLY, CONTROLLETSTR 61
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C-EXCLUDED                    = 3 = BYPASS ALL, AFTER SURCHARGE BEGINS (CONTSTR 62
C-EXCLUDED                    = 4 = BACK UP                                    TSTR 63
C-EXCLUDED                    = 5 = PASS THROUGH (UNDER HEAD)                  TSTR 64
C-EXCLUDED       *            = 6 = FLOODS (AND SIMULATION TERMINATES)         TSTR 65
C                     ISTOUT = OUTLET TYPE (GRAVITY, PUMP)                    TSTR 66
C                    *       = 1 = GRAVITY WITH FIXED ORIFICE                 TSTR 67
C                    *       = 2 = GRAVITY WITH FIXED WEIR                    TSTR 68
C                            = 3 = GRAVITY WITH FIXED SIDE-WEIR               TSTR 69
C                            = 4 = GRAVITY WITH FIXED SIPHON                  TSTR 70
C                    *       = 5 = NEW PUMPS                                  TSTR 71
C                            = 6 = EXISTING PUMPS                             TSTR 72
C                            = 7 = ADJUSTABLE VALVE WITH GRAVITY              TSTR 73
C                    *       = 8 = SLUICE GATE WITH GRAVITY                   TSTR 74
C-EXCLUDED           ISTBUP = BACK-UP EFFECTS (YES/NO)                        TSTR 75
C-EXCLUDED                  = 1 = NO                                          TSTR 76
C-EXCLUDED                  = 2 = YES, UPSTREAM OF INLET POINT                TSTR 77
C-EXCLUDED                  = 3 = YES, UPSTREAM OF OUTLET POINT               TSTR 78
C                                                                             TSTR 79
      DO 950  KK=1,NE                                                         TSTR 80
  950 IF(KSTORE(KK).EQ.KSTOR) GO TO 970                                       TSTR 90A
      WRITE(6,604)                                                            TSTR 90B
  604 FORMAT('CELEMENT NO. TRACEBACK ERROR')                                  TSTR 90C
      STOP                                                                    TSTR 90D
  970 WRITE(6,602)  KSTOR, NOE(KK),(NUE(KK,II),II=1,3),                       TSTR 90E
     *              ISTOUT(KSTOR), ISTMOD(KSTOR), ISTTYP(KSTOR)               TSTR 81X
  602 FORMAT('C', /, ' ', 5X,                                                 TSTR 82
     *       'CHARACTERISTICS OF STORAGE  UNIT NUMBER', I4, ' ARE'            TSTR 83
     *     /,  'O', 10X, 'ELEMENT NUMBER =', I4, 24X,                        TSTR 84
     *                   'U/S ARE', I4, ',', I4, ',', I4, 23X,               TSTR 85
     *                   'OUTLET TYPE  =', I3, 12X,                          TSTR 86
     *     /,  ' ', 10X, 'STORAGE  MODE    =', I3, 27X,                       TSTR 87
     *                   'STORAGE  TYPE =', I3)                              TSTR 88
C                   IPOL   = 0 = HYDRAULICS ONLY (NO SOLIDS)                  TSTR 89
C                          = 1 = SOLIDS PRESENT                               TSTR 90
C                   IPRINT = 0 = NO PRINTOUT EACH TIME-STEP (SUMMARY POSTSTR 92
C                          = 1 = PRINTOUT ALL TIME-STEP SOLUTIONS (EACH TSTR 93
      READ(5,502)  IPOL(KSTOR), IPRINT(KSTOR), ICOST(KSTOR)                  TSTR 94
  502 FORMAT(3I10)                                                            TSTR 95
      WRITE(6,603)  IPOL(KSTOR), IPRINT(KSTOR), ICOST(KSTOR)                 TSTR 96
  603 FORMAT('O', 99X, 'IPOL =', I2, ', IPRINT =', I2, ', ICOST =', I2)      TSTR 97
      NOED=NOE(KK)                                                            TSTR 97A
C                                                                             TSTR 98
C---------          READ RESERVOIR PARAMETERS                                TSTR 99
C                                                                             TSTR100
C                                                                             TSTR101
C                   BRANCH TO STORAGE  TYPE (ISTTYP)                          TSTR102
 1000   K = ISTTYP(KSTOR)                                                     TSTR103
      GO TO (1100,1200,1200, 904, 904), K                                     TSTR104
C                                                                             TSTR105
      GO TO (1100,1200,1200, 904, 904), K                                     TSTR106
C                                                                             TSTR107
C                   A)  FOR IRREGULAR (NATURAL) RESERVOIR                     TSTR108
C                                                                             TSTR109
 1100 READ(5,511)  DEPMAX(KSTOR)                                              TSTR110
  511 FORMAT(F10.2)                                                           TSTR111
C                   DEPMAX = MAX. ALLOWABLE DEPTH IN RESERVOIR (FT.)          TSTR112
      WRITE(6,611)  DEPMAX(KSTOR)                                             TSTR113
  611 FORMAT('C', 15X, 'NATURAL RESERVOIR, WITH MAX. DEPTH =', F7.2,          TSTR114
                                                                              TSTR115
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     *' FT.',10X,  ' 11 DEPTH/AREA PARAMETERS ARE', //,                  TSTR116
     *       ' ', 20X, 4('DEPTH(FT) AREA(SQ.FT)', 4X))                   TSTR117
      READ(5,512)  (ADEPTH(II), AASURF(II),  II=1,11)                    TSTR118
  512 FORMAT(4(F10.2, F10.0))                                             TSTR119
C                   ADEPTH = DATA DEPTH (FT), 0 - DEPMAX.               TSTR120
C                   AASURF = DATA SURF. AREA OF NAT. RESERVOIR (SQ. FT.)TSTR121
      WRITE(6,612)  (ADEPTH(II), AASURF(II),  II=1,11)                    TSTR122
  612 FORMAT(   ' ', 18X, F10.2, F10.0, 5X, F10.2, F10.0, 5X,             TSTR123
     *                    F10.2, F10.0, 5X, F10.2, F10.0)                 TSTR124
        APLAN(KSTOR) = AASURF(11)                                         TSTR125
      IF (ADEPTH(11) .LT. DEPMAX(KSTOR))  GO TO 903                       TSTR126
      GO TO 2000                                                          TSTR127
C                                                                         TSTR128
C                   B)  FOR REGULAR (MAN-MADE) RESERVOIR                  TSTR129
C                                                                         TSTR130
 1200 READ(5,511)  DEPMAX(KSTOR)                                          TSTR131
      READ(5,513)  BASEA, BASEC, COTSLO                                   TSTR132
  513 FORMAT(2F10.0, F10.5)                                               TSTR133
C                   BASEA  = BASE AREA OF RESERVOIR (SQ.FT.)              TSTR134
C                   BASEC  = BASE CIRCUMF. OF RESERVOIR (FT.)             TSTR135
C                   COTSLO = COTAN OF SIDESLOPE ANGLE (HORIZ/VERT)        TSTR136
        APLAN(KSTOR) = BASEA + BASEC*COTSLO*DEPMAX(KSTOR)*1.1             TSTR137
      WRITE(6,613)  DEPMAX(KSTOR), BASEA, BASEC, COTSLO                   TSTR138
  613 FORMAT('0', 15X, 'MAN-MADE RESERVOIR, WITH MAX. DEPTH =', F7.2,     TSTR139
     *   ' FT.,  AND CHARACTERISTICS',   /, '0', 20X,                     TSTR140
     *       'BASE AREA =', F10.0, ' SQ.FT.,', 7X,                        TSTR141
     *       'BASE CIRCUMF. =', F10.0, ' FT.,', 6X,                       TSTR142
     *       'COT(SIDESLOPE) =', F10.5)                                   TSTR143
C                                                                         TSTR144
C-------              READ OUTLET CONTROL DATA                            TSTR145
C                                                                         TSTR146
C                   BRANCH TO OUTLET TYPE (ISTOUT)                        TSTR147
C                                                                         TSTR148
 2000   K = ISTOUT(KSTOR)                                                 TSTR149
      GO TO (2100,2200, 906, 906, 906,2600, 906, 906,2900), K             TSTR150
C                                                                         TSTR151
C                   A)  OUTLET BY GRAVITY WITH FIXED ORIFICE              TSTR152
C                                                                         TSTR153
 2100 READ(5,521)  CDAOUT                                                 TSTR154
  521 FORMAT(F10.3)                                                       TSTR155
C                   CDAOUT = OUTLET ORIFICE AREA * DISCHARGE COEFFICIENTTSTR156
      WRITE(6,621)  CDAOUT, DT                                            TSTR157
  621 FORMAT('0', 15X, 'RESERVOIR OUTLET CONTROL BY GRAVITY WITH FIXED OTSTR158
     *RIFICE', /, ' ', 15X, 'ORIFICE AREA*CD =', F10.3, ' SQ.FT,  DT =',TSTR159
     *F10.2, ' SEC. (FROM INPUT HYDROGRAPH)', /, ' ', 15X, 'NOTE..', /, TSTR160
     *' ', 18X, 'ORIFICE CENTERLINE ASSUMED AT TANK DEPTH = 0, WHEN STORTSTR161
     *AGE = 0')                                                          TSTR162
C                                                                         TSTR163
      GO TO 3000                                                          TSTR164
C                                                                         TSTR165
C                   B)  OUTLET BY GRAVITY WITH FIXED WEIR                 TSTR166
C                                                                         TSTR167
 2200 READ(5,522)  WEIRHT, WEIRL                                          TSTR168
  522 FORMAT(2F10.3)                                                      TSTR169
C                   WEIRHT = RES. DEPTH (FT) WHEN SURF. AT WEIR ELEV.     TSTR170
C                   WEIRL  = WEIR LENGTH (FT)                             TSTR171
C                   WEIRQ  = 3.33*(DEPTH-WEIRHT)**1.5  (CFS/FT)           TSTR172
      WRITE(6,622)  WEIRHT, WEIRL, DT                                     TSTR173
  622 FORMAT('0', 15X, 'RESERVOIR OUTLET CONTROL BY GRAVITY WITH FIXED WTSTR174
     *EIR', /, ' ', 15X, 'WEIR HEIGHT =', F6.2, ' FT, WEIR LENGTH =',     TSTR175
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     * F7.2, ' FT,  DT =', F10.2, ' SEC. (FROM INPUT HYDROGRAPH)')                TSTR176
C                                                                                 TSTR177
      GO TO 3000                                                                  TSTR178
C                                                                                 TSTR179
C                                                                                 TSTR180
C                     F) OUTLET BY EXISTING PUMPS                                 TSTR181
C                                                                                 TSTR182
 2600 READ(5,526)  QPUMP(KSTOR),DSTART(KSTOR),DSTOP(KSTOR)                        TSTR183
  526 FORMAT(3F10.3)                                                              TSTR184
C                     QPUMP   = CONSTANT PUMPED OUTFLOW RATE (CFS)                TSTR185
C                     DSTART = RESERVOIR DEPTH AT START OF PUMPING (FT)           TSTR186
C                     DSTOP   = RESERVOIR DEPTH AT END   OF PUMPING (FT)          TSTR187
      WRITE(6,626)  QPUMP(KSTOR),DSTART(KSTOR),DSTOP(KSTOR)                      TSTR188
  626 FORMAT('0', 15X, 'RESERVOIR OUTFLOW BY FIXED-RATE PUMPING', /,              TSTR189
     *       ' ', 15X, 'PUMPING RATE =', F7.2, ' CFS, PUMPING START',             TSTR190
     *       ' DEPTH =', F6.2, ' FT, PUMPING STOP DEPTH =', F6.2, ' FT')          TSTR191
      IF (DSTART(KSTOR) .GT. DSTOP(KSTOR))  GO TO 3000                           TSTR192
C                                                                                 TSTR193
       DSTOP(KSTOR) = DSTART(KSTOR) - 0.5                                         TSTR194
      WRITE(6,627)                                                                TSTR195
  627 FORMAT('0****** WARNING. STOP DEPTH SHOULD BE LESS THAN START',             TSTR196
     *       ' DEPTH', /, ' ', 10X, 'RESET STOP DEPTH TO', F6.2, ' FT')          TSTR197
      GO TO 3000                                                                  TSTR198
C                                                                                 TSTR199
C                     I)   OUTLET BY GRAVITY WITH FIXED WEIR AND ORIFICE          TSTR200
C                                                                                 TSTR201
 2900 READ (5,529) WEIRHT,WEIRL,CDAOUT,ORIFHT                                     TSTR202
  529 FORMAT (8F10.5)                                                             TSTR203
C                     WEIRHT = RES.DEPTH (FT) WHEN SURF. AT WEIR ELEV.            TSTR204
C                     WEIRL  = WEIR LENGTH (FT)                                   TSTR205
C                     CDAOUT = OUTLET ORIFICE AREA * DISCHARGE COEFFICIENT        TSTR206
C                     ORIFHT = ORIF. CENTERLINE ELEV. ABOVE ZERO DEPTH(FT)        TSTR207
      WRITE (6,629) WEIRHT,WEIRL,DT,CDAOUT,ORIFHT                                 TSTR208
  629 FORMAT (/16X,'RESERVOIR OUTLET CONTROL BY GRAVITY WITH FIXED ORIFI          TSTR209
     1CE AND FIXED WEIR'/16X,'WEIR HEIGHT=',F6.2,' FT, WEIR LENGTH='              TSTR210
     2 F7.2,' FT, DT=',F10.2,' SEC. (FROM INPUT HYDROGRAPH)'/16X,                 TSTR211
     3'ORIFICE AREA*CD='F10.3,' SQ.FT, HEIGHT OF ORIFICE CENTERLINE ABOV          TSTR212
     4E ZERO DEPTH='F6.2,' FT')                                                   TSTR213
      J = NIN(NODE)                                                               TSTR214
      J = GEOM3(J)                                                                TSTR215
      WRITE (6,630) J                                                             TSTR216
  630 FORMAT (16X,'OUTFLOW FROM ORIFICE IS TO ELEMENT NUMBER'I5)                  TSTR217
      GO TO 3000                                                                  TSTR218
C                                                                                 TSTR219
C                     END OF INPUT PARAMETERS FOR STORAGE UNITS                   TSTR220
C                                                                                 TSTR221
C                                                                                 TSTR222
C---------------- COMPUTE DEPTH/STORAGE RELATION (ARRAY) ----------------         TSTR223
C                                                                                 TSTR224
C                     NOTE                                                        TSTR225
C                      RUBBER BAG AND INTRASYSTEM DO NOT HAVE 'DEPTH'             TSTR226
C                                                                                 TSTR227
C                     BRANCH TO STORAGE TYPE (ISTTYP)                             TSTR228
 3000   K = ISTTYP(KSTOR)                                                         TSTR229
      GO TO (3100,3200,3200, 904, 904), K                                         TSTR230
C                                                                                 TSTR231
C---------            A)  FOR 'NATURAL' RESERVOIR                                TSTR232
C                                                                                 TSTR233
 3100   DDEPTH = DEPMAX(KSTOR)/10.0                                               TSTR234
      J = ISTOUT(KSTOR)                                                           TSTR235
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      IF (J.EQ.2.OR.J.EQ.3.OR.J.EQ.9) DDEPTH = WEIRHT/3.0                TSTR236
        DUMDEP(1) = 0.0                                                  TSTR237
        DEPTH  = 0.0                                                     TSTR238
C                                                                        TSTR239
      CALL TINTRP(ADEPTH, AASURF, 11, DEPTH, AREA, KFLAG)                TSTR240
C                                                                        TSTR241
      IF (KFLAG .NE. 0)  GO TO 901                                       TSTR242
        AREA2  = AREA                                                    TSTR243
        DUMSTR(1) = 0.0                                                  TSTR244
      DO 3150  II=2,11                                                   TSTR245
        AREA1  = AREA2                                                   TSTR246
      IF ((J.EQ.2.OR.J.EQ.3.OR.J.EQ.9).AND.II.EQ.5) DDEPTH =             TSTR247
     * (DEPMAX(KSTOR) - WEIRHT)/7.0                                     TSTR248
        DUMDEP(II) = DUMDEP(II-1) + DDEPTH                               TSTR249
        DEPTH  = DUMDEP(II)                                              TSTR250
C                                                                        TSTR251
      CALL TINTRP(ADEPTH, AASURF, 11, DEPTH, AREA, KFLAG)                TSTR252
C                                                                        TSTR253
      IF (KFLAG .NE. 0)  GO TO 901                                       TSTR254
        AREA2  = AREA                                                    TSTR255
 3150   DUMSTR(II) = DUMSTR(II-1) + 0.5*DDEPTH*(AREA1+AREA2)             TSTR256
      WRITE(6,631)                                                       TSTR257
  631 FORMAT('0', 20X, 4('DEPTH(FT) STOR(CU.FT)', 4X))                   TSTR258
      WRITE(6,632)  (DUMDEP(II), DUMSTR(II),  II=1,11)                   TSTR259
  632 FORMAT(    ' ', 18X, F9.2, F11.0, 5X, F9.2, F11.0, 5X,             TSTR260
     *                     F9.2, F11.0, 5X, F9.2, F11.0)                 TSTR261
      GO TO 3300                                                         TSTR262
C                                                                        TSTR263
C---------          B)  FOR MAN-MADE RESERVOIR                           TSTR264
C                                                                        TSTR265
 3200   DDEPTH = DEPMAX(KSTOR)/10.0                                       TSTR266
      J = ISTOUT(KSTOR)                                                  TSTR267
      IF (J.EQ.2.OR.J.EQ.3.OR.J.EQ.9) DDEPTH = WEIRHT/3.0                TSTR268
        DUMDEP(1) = 0.0                                                  TSTR269
        DUMSTR(1) = 0.0                                                  TSTR270
      DO 3250  II=2,11                                                   TSTR271
      IF ((J.EQ.2.OR.J.EQ.3.OR.J.EQ.9).AND.II.EQ.5) DDEPTH =             TSTR272
     * (DEPMAX(KSTOR) - WEIRHT)/7.0                                     TSTR273
        DUMDEP(II) = DUMDEP(II-1) + DDEPTH                               TSTR274
 3250   DUMSTR(II) = (BASEA + 0.5*BASEC*DUMDEP(II)*CUTSLO)*DUMDEP(II)    TSTR275
      WRITE(6,631)                                                       TSTR276
      WRITE(6,632)  (DUMDEP(II), DUMSTR(II),  II=1,11)                   TSTR277
C                                                                        TSTR278
 3300 DO 3350  II=1,11                                                   TSTR279
        BSTOR(KSTOR,II)  = DUMSTR(II)                                    TSTR280
 3350   BDEPTH(KSTOR,II) = DUMDEP(II)                                    TSTR281
C                                                                        TSTR282
C                    END OF DEPTH/STORAGE COMPUTATIONS                   TSTR283
C                                                                        TSTR284
C----------------- BRANCH TO STORAGE MODE (ISTMOD) --------------------TSTR285
C                                                                        TSTR286
        K = ISTMOD(KSTOR)                                                TSTR287
      GO TO (4000, 905, 905, 905), K                                     TSTR288
C                                                                        TSTR289
C------------------ COMPUTE AND PRINT ROUTING PARAMETERS -------------- TSTR290
C                                                                        TSTR291
C                    BRANCH TO OUTLET TYPE (ISTOUT)                      TSTR292
C                                                                        TSTR293
 4000   K = ISTOUT(KSTOR)                                                TSTR294
      GO TO (4100,4200, 906, 906, 8000,4600, 906, 906,4900), K           TSTR295
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C
C-------------        COMPUTE AND PRINT ROUTING PARAMETERS        --------- TSTR296
C                                                                           TSTR297
C---------              A)  FOR ORIFICE OUTLET                               TSTR298
C                                                                           TSTR299
 4100   DT2    = 0.5*DT                                                     TSTR300
      DO 4150  II=1,11                                                      TSTR301
        DEPTH  = CUMDEP(II)                                                 TSTR302
        STOR   = DUMSTR(II)                                                 TSTR303
        QOUT   = CDAOUT*SQRT(64.4*DEPTH)                                    TSTR304
C                                                                           TSTR305
        AO2DT2(KSTOR,II) = QOUT*DT2                                         TSTR306
 4150   ATERM(KSTOR,II)  = QOUT*DT2 + STOR                                  TSTR307
      WRITE(6,641)  DT, (ATERM(KSTOR,II), II=1,11),                         TSTR308
     *                   (AO2DT2(KSTOR,II), II=1,11)                      TSTR309
  641 FORMAT('0', 20X, 'THE TWO SETS OF 11 STORAGE PARAMETERS, FOR DT ='TSTR310
     *       , F10.3, ' SEC., ARE..',  /, '0', 11X, 'ATERM.. ',          TSTR311
     *                  11F10.0,  /, ' ', 11X, 'AO2DT2..', 11F10.0)       TSTR312
      GO TO 8000                                                            TSTR313
C                                                                           TSTR314
C---------              B)  FOR WEIR OUTLET                                 TSTR315
C                                                                           TSTR316
 4200   DT2    = 0.5*DT                                                     TSTR317
      DO 4250  II=1,11                                                      TSTR318
        DEPTH  = DUMDEP(II)                                                 TSTR319
        STOR   = DUMSTR(II)                                                 TSTR320
        H      = DEPTH - WEIRHT                                             TSTR321
        QOUT   = 0.0                                                        TSTR322
      IF (H .GT. 0.0)  QOUT = WEIRL*3.33*H*SQRT(H)                          TSTR323
C                                                                           TSTR324
        AO2DT2(KSTOR,II) = QOUT*DT2                                         TSTR325
 4250   ATERM(KSTOR,II)  = QOUT*DT2 + STOR                                  TSTR326
      WRITE(6,641)  DT, (ATERM(KSTOR,II), II=1,11),                         TSTR327
     *                   (AO2DT2(KSTOR,II), II=1,11)                      TSTR328
      GO TO 8000                                                            TSTR329
C                                                                           TSTR330
C-------------          CHECK BUFFER VOLUME FOR PUMPED OUTFLOW      ---------TSTR331
C                                                                           TSTR332
 4600   DSTRT = DSTART(KSTOR)                                               TSTR333
      CALL TINTRP(DUMDEP, DUMSTR, 11, DSTRT, STORHI, KFLAG)                 TSTR334
C                                                                           TSTR335
      IF (KFLAG .NE. 0)  GO TO 901                                          TSTR336
C                                                                           TSTR337
        DSTP = DSTOP(KSTOR)                                                 TSTR338
      CALL TINTRP(CUMDEP, DUMSTR, 11, DSTP, STORLO, KFLAG)                  TSTR339
C                                                                           TSTR340
      IF (KFLAG .NE. 0)  GO TO 901                                          TSTR341
        STORDV = STORHI - STORLO                                            TSTR342
        PUMPDV = QPUMP(KSTOR)*DT                                            TSTR343
        DVR    = STORDV/PUMPDV                                              TSTR344
      IF (DVR .LT. 1.0)  GO TO 4650                                         TSTR345
C                                                                           TSTR346
      WRITE(6,646)  DVR                                                     TSTR347
  646 FORMAT('0', 15X, 'STORAGE BETWEEN LEVELS DSTART AND DSTOP =',         TSTR348
     *       F7.3, ' TIMES (QPUMP*DT)')                                    TSTR349
      GO TO 8000                                                            TSTR350
C                                                                           TSTR351
 4650 WRITE(6,647)  STORHI, STORLO, STORDV, PUMPDV                          TSTR352
  647 FORMAT('0',20X, 'AT LEVEL DSTART, STORAGE    =', F10.0,' CU.FT',/,TSTR353
     *       ' ',20X, 'AT LEVEL DSTOP,  STORAGE    =', F10.0,' CU.FT',/,TSTR354
                                                                            TSTR355
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     *       ' ',20X, 'DIFFERENCE = BUFFER STORAGE =', F10.0,' CU.FT',/,TSTR356
     *   '0',16X, 'CF. VOLUME PUMPED / TIME-STEP   =', F10.0,' CU.FT',/,TSTR357
     *   '0',10X, 'A RELIABLE MODEL REQUIRES THE VOLUME PUMPED / TIME-',TSTR358
     *   'STEP TO BE LESS THAN THE BUFFER STORAGE', /,                  TSTR359
     *   ' ',10X, 'THEREFORE ONE OF THE FOLLOWING AMENDMENTS SHOULD ',  TSTR360
     *   'PROBABLY BE MADE TO THE INPUT DATA -', /,                     TSTR361
     *   ' ',15X, 'A)  REDUCE QPUMP RATE', /,                          TSTR362
     *   ' ',15X, 'B)  REDUCE DSTOP LEVEL', /,                         TSTR363
     *   ' ',15X, 'C)  INCREASE DSTART LEVEL', /,                      TSTR364
     *   ' ',15X, 'D)  INCREASE RESERVOIR PLAN AREAS', /,              TSTR365
     *   '0', 2X, '****    FOR THE ABOVE REASONS, THE FOLLOWING OUTPUT',TSTR366
     *   ' IS NOT NECESSARILY RELIABLE')                               TSTR367
      GO TO 8000                                                       TSTR368
C                                                                      TSTR369
C---------          II)  FOR WEIR AND ORIFICE OUTLETS COMBINED         TSTR370
C                                                                      TSTR371
 4900 DT2 = 0.5*DT                                                     TSTR372
      DO 4950 II=1,11                                                  TSTR373
      DEPTH = CUMDEP(II)                                               TSTR374
      STOR = CUMSTR(II)                                                TSTR375
      QOUT = 0.0                                                       TSTR376
      DD = DEPTH-ORIFHT                                                TSTR377
      IF (DD.GT.0.0) QOUT=QOUT+CDAOUT*SQRT(64.4*DD)                    TSTR378
      OUT1(KSTOR,II) = QOUT*DT2                                        TSTR379
      H = DEPTH-WEIRHT                                                 TSTR380
      IF (H.GT.0.0) QOUT=QOUT+WEIRL*3.33*H*SQRT(H)                     TSTR381
      AO2DT2(KSTOR,II) = QOUT*DT2                                      TSTR382
 4950 ATERM(KSTOR,II) = QOUT*DT2+STOR                                  TSTR383
      WRITE (6,641) DT,(ATERM(KSTOR,II),II=1,11),                      TSTR384
     1 (AO2DT2(KSTOR,II),II=1,11)                                      TSTR385
      GO TO 8000                                                       TSTR386
C                                                                      TSTR387
C----------------- READ RESERVOIR INITIAL CONDITIONS -----------------TSTR388
C                                                                      TSTR389
C                   STORO  = STORAGE (CU.FT.) AT T = 0                 TSTR390
C                   QOUTO  = OUTFLOW RATE (CFS) AT T = 0               TSTR391
 8000 READ(5,551)  STORO(KSTOR), QOUTO(KSTOR)                         TSTR392
  551 FORMAT(2F10.2)                                                   TSTR393
      STORE(KSTOR)=STORO(KSTOR)                                        TSTR394
C                                                                      TSTR395
C------------------ READ STORAGE UNIT UNIT COSTS ----------------------TSTR396
C                                                                      TSTR397
      READ(5,561)  CPCUYD(KSTOR), CPACRE(KSTOR), CPS(KSTOR)           TSTR398
  561 FORMAT(F10.2, 2F10.0)                                            TSTR399
C                                                                      TSTR400
        IFLOOD(KSTOR) = 0                                              TSTR401
C                                                                      TSTR402
 8888 CONTINUE                                                         TSTR403
C                                                                      TSTR404
      GO TO 5555                                                       TSTR405
C                                                                      TSTR406
C------------------ ERROR MESSAGES -----------------------------------TSTR407
C                                                                      TSTR408
  901 IF (KFLAG .EQ. 10)  GO TO 902                                    TSTR409
      WRITE(6,691)                                                     TSTR410
  691 FORMAT('0 *** TERMINATE - INPUT TO TINTRP PROCEDURE IS LESS THAN LTSTR411
     *OWEST VALUE ON CURVE (IN SUBRT. TSTRDT)')                        TSTR412
      STOP                                                             TSTR413
C                                                                      TSTR414
  902 WRITE(6,692)                                                     TSTR415
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  692 FORMAT('0 *** TERMINATE - INPUT TO TINTRP PROCEDURE IS GREATER THATSTR416
     *N LARGEST VALUE ON CURVE (IN SUBRT. TSTRDT)')
      STOP                                                              TSTR417
C                                                                       TSTR418
  903 WRITE(6,693)  KSTOR, DEPMAX(KSTOR), ADEPTH(11)                    TSTR419
  693 FORMAT('C *** FOR RESERVOIR NO.', I4,                             TSTR420
     *                                  ', THE MAX. DEPTH, DEPMAX =',   TSTR421
     * F7.2, ' FT, IS OUTSIDE DEPTH PARAMETER RANGE.  LARGEST DEPTH PARATSTR422
     *METER, ADEPTH(11) =', F7.2)                                       TSTR423
      STOP                                                              TSTR424
C                                                                       TSTR425
  904 WRITE(6,694)  ISTTYP(KSTOR), KSTOR                                TSTR426
  694 FORMAT('0 *** ISTTYP =', I3, ', IN RESERVOIR NO.', I4,            TSTR427
     * ', IS OF A TYPE NOT PRESENTLY MODELED')                          TSTR428
      STOP                                                              TSTR429
C                                                                       TSTR430
  905 WRITE(6,695)  ISTMOD(KSTOR), KSTOR                                TSTR431
  695 FORMAT('0 *** ISTMOD =', I3, ', IN RESERVOIR NO.', I4,            TSTR432
     *       ', IS OF A TYPE NOT PRESENTLY MODELED')                    TSTR433
      STOP                                                              TSTR434
C                                                                       TSTR435
  906 WRITE(6,696)  ISTOUT(KSTOR), KSTOR                                TSTR436
  696 FORMAT('0 *** ISTOUT =', I3, ', IN RESERVOIR NO.', I4,            TSTR437
     *       ', IS OF A TYPE NOT PRESENTLY MODELED')                    TSTR438
      STOP                                                              TSTR439
C                                                                       TSTR440
  907 WRITE(6,697)  ISTINF, KSTOR                                       TSTR441
  697 FORMAT('0 *** ISTINF =', I3, ', IN RESERVOIR NO.', I4,            TSTR442
     *       ', IS OF A TYPE NOT PRESENTLY MODELED')                    TSTR443
      STOP                                                              TSTR444
C                                                                       TSTR445
C                                                                       TSTR446
 9999 RETURN                                                            TSTR447
      END                                                               TSTR448
C=======================================================================TSTR449
                                                                        TSTR450
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      SUBROUTINE TSTORG                                                 TSTO  1
      COMMON/TABLES/KDEPTH(25),KLASS(25),PSIMAX(15),ALPMAX(15),         TSTO  2
     1              NN(25),MM(25),ANORM(15,51),QNORM(15,51),           TSTO  3
     2              DNORM(15,51),AFACT(15),RFACT(15)                   TSTO  4
      COMMON A(160,2,2) ,Q(160,2,2) , CPOLL(160,2,2,3), QMAX(160),      TSTO  5X
     1       QFULL(160), AFULL(160), DXDT(160),C1(160), SLOPE(160),     TSTO  6
     2       DIST(160), GEOM1(160), ROUGH(160), NOE(160), NUE(160,3),   TSTO  7
     3       IAUE(160,3), NTYPE(160), JR(160), NKLASS, NE, NDT, EPSIL,  TSTO  8
     4       TIME, DT, M, KFULL, N, NOS, NPOLL, NPRINT, ITER,           TSTO  9
     5       QDWF(160), IOLD(160), P1(160), RNOFF(160), QINFIL(160),    TSTO 10
     6       WDWF(160,3), PLUTO(160,3), IR(160), P2(160), NIN(1000),    TSTO 11X
     7       P5(160),P6(160),P7(160),SCF(160),BARREL(160),              TSTO 12
     8       TITLE(40), NAME(20), RYM(20), NUMBER(70), GEOM2(160),      TSTO 13X
     9       GEOM3(160) , P4(160),SCOUR(160), KSTORE(160)               TSTO 14
      COMMON  BODIN( 2,150),SSIN( 2,150),BODOUT,SSOUT,COLIN(2,150),     TSTO 15X
     *  QINST,COLST,QINSTL( 2),COUSTL( 2),STORL( 2),QOUTO( 2),STORO( 2),TSTO 16
     *  NSTOR,KSTOR,IPRINT( 2),IPOL( 2),IFLOOD( 2),ICOST( 2),DEPMAX( 2),TSTO 17
     *  ATERM( 2,11),AO2DT2( 2,11),BDEPTH( 2,11),BSTOR( 2,11),COLOUT,    TSTO 18X
     *  DUMSTR(11),DUMDEP(11),                                          TSTO 19
     *  KTSTEP,VOLIN( 2,150),VOLOUT( 2,150),STOR,CUMIN( 2),CUMOUT( 2),  TSTO 20
     *  SBOD( 2),SSS( 2),SCOL( 2),                                      TSTO 21X
     *  ISTMOD( 2),ISTTYP( 2),ISTOUT( 2),                               TSTO 22
     *  QPUMP( 2),DSTART( 2),DSTOP( 2),                                 TSTO 23
     *  DTON( 2),STORMX( 2),DTPUMP( 2),DTMORE( 2),STORF( 2),APLAN( 2),  TSTO 24
     *  CLAND( 2),CSTOR( 2),CPS( 2),CTOTAL( 2),CPCUYD( 2),CPACRE( 2),   TSTO 25
     *  LP,JP,LPREV( 2),LABEL,DETENT(150),FRAC(150),OUT1(10,200)        TSTO 26X
C                                                                       TSTO 27X
      DIMENSION  DEPTHL( 2)                                             TSTO 28
      DIMENSION QO1(150),QO2(150)                                       TSTO 29
      EQUIVALENCE (QO1(1),QMAX(1)),(QO2(1),QFULL(1))                    TSTO 30
C                                                                       TSTO 31
      IF (KTSTEP .GT. 1 .OR. KSTOR .GT. 1)  GO TO 1300                  TSTO 32
C                                                                       TSTO 33
      DO 1050  KSTDUM=1,NSTOR                                           TSTO 34
      IF (IPRINT(KSTDUM) .GT. 0)  GO TO 1100                            TSTO 35
 1050 CONTINUE                                                          TSTO 36
      GO TO 1200                                                        TSTO 37
C                                                                       TSTO 38
 1100 WRITE(6,601)  NDT                                                 TSTO 39
  601 FORMAT('1STORAGE SOLUTION FOR', I4, ' TIME-STEPS FOLLOWS',        TSTO 40
     *       ', ON A STEP-BY-STEP BASIS', //)                           TSTO 41
      WRITE(6,602)                                                      TSTO 42
  602 FORMAT('OU STP TIME INFLOW OUTFLOW  STORAGE DEPTH', 2X, 'IN: BOD',TSTO 43
     *       5X, 'SS STOR: BOD', 7X, 'SS', 4X, 'BOD', 5X, 'SS OUT: BOD',TSTO 44
     *       5X, 'SS', 4X, 'BOD', 5X, 'SS', 2X, ' J   L', /,           TSTO 45
     *       ' R RC (MIN)  (CFS)  (CFS)   (CU.FT) (FT.)', 5X,         TSTO 46
     *       '(LB)   (LB)', 6X, '(LB)', 5X, '(LB) (MG/L) (MG/L)', 5X, TSTO 47
     *       '(LB)   (LB) (MG/L) (MG/L)', 2X, ' P   P', /)            TSTO 48
C                                                                       TSTO 49
 1200 DO 1250  KSTDUM=1,NSTOR                                           TSTO 50
        STORMX(KSTDUM) = 0.0                                            TSTO 51
        LPREV(KSTDUM)  = 1                                              TSTO 52
        SBOD(KSTDUM)   = 0.0                                            TSTO 53
        SSS(KSTDUM)    = 0.0                                            TSTO 54
        SCOL(KSTDUM)   = 0.0                                            TSTO 54A
        STOR = STORO(KSTDUM)                                            TSTO 55
      DO 1230  I=1,11                                                   TSTO 56
        DUMSTR(I) = BSTOR(KSTDUM,I)                                     TSTO 57
 1230   DUMDEP(I) = BDEPTH(KSTDUM,I)                                    TSTO 58
C                                                                       TSTO 59
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      CALL TINTRP(DUMSTR,DUMDEP,11,STOR,DEPTH,KFLAG)                    TSTO 60
C                                                                       TSTO 61
      IF (KFLAG .EQ. -10)  GO TO 901                                    TSTO 62
      IF (KFLAG .EQ.  10)  GO TO 8000                                   TSTO 63
C                                                                       TSTO 64
        DEPTHL(KSTDUM) = DEPTH                                          TSTO 65
      IF (DEPTH .GT. DEPMAX(KSTDUM))  GO TO 8000                        TSTO 66
      IF (IPRINT(KSTDUM) .LT. 1)  GO TO 1250                            TSTO 67
      WRITE(6,603)  KSTDUM, QOUTO(KSTDUM), STORO(KSTDUM), DEPTH         TSTO 68
  603 FORMAT(' ', I1, '  0   0.0    0.0', F7.1, F10.0, F6.2)            TSTO 69
 1250 CONTINUE                                                          TSTO 70
      WRITE(6,604)                                                      TSTO 71
  604 FORMAT('    ')                                                    TSTO 72
C-----------                                                            TSTO 73
 1300 DO 1350  II=1,11                                                  TSTO 74
        DUMSTR(II) = BSTOR(KSTOR,II)                                    TSTO 75
 1350   DUMDEP(II) = BDEPTH(KSTOR,II)                                   TSTO 76
        RKTSTP = KTSTEP                                                 TSTO 77
        TIME2M = DT*RKTSTP/60.0                                         TSTO 78
        BODOUT = 0.0                                                    TSTO 79
        SSOUT  = 0.0                                                    TSTO 80
        COLOUT = 0.0                                                    TSTO 80A
C                                                                       TSTO 81
      IF (ISTOUT(KSTOR) .EQ. 5 .OR. ISTOUT(KSTOR) .EQ. 6)  GO TO 2000   TSTO 82
      GO TO 3000                                                        TSTO 83
C-----------                                                            TSTO 84
 2000 IF (KTSTEP .GT. 1)  GO TO 2100                                    TSTO 85
        QINSTL(KSTOR) = 0.0                                             TSTO 86
        QOUSTL(KSTOR) = QOUTO(KSTOR)                                    TSTO 87
        STORL(KSTOR)  = STORO(KSTOR)                                    TSTO 88
        CUMIN(KSTOR)  = 0.0                                             TSTO 89
        CUMOUT(KSTOR) = 0.0                                             TSTO 90
        STOR    = STORO(KSTOR)                                          TSTO 91
        LP      = 0                                                     TSTO 92
        JP      = 0                                                     TSTO 93
        DTON(KSTOR)   = 0.0                                             TSTO 94
C                                                                       TSTO 95
 2100   VOLIN(KSTOR,KTSTEP) = 0.5*DT*(QINSTL(KSTOR) + QINST)           TSTO 96
        VOLOUZ = DT*QOUSTL(KSTOR)                                       TSTO 97
        STORZ  = STORL(KSTOR) + VOLIN(KSTOR,KTSTEP) - VOLOUZ            TSTO 98
C                                                                       TSTO 99
      CALL TINTRP(DUMSTR,DUMDEP,11,STORZ,DEPTHZ,KFLAG)                  TST0100
C                                                                       TST0101
      IF (KFLAG .EQ. -10)  GO TO 901                                    TST0102
      IF (KFLAG .EQ.  10)  GO TO 8000                                   TST0103
C                                                                       TST0104
C   ***              THE FOLLOWING STATEMENTS, ABOVE 2150, ARE TEMPORARY TST0105
C                                                                       TST0106
                                                                        TST0107
      IF (QINST .GT. QPUMP(KSTOR) .AND. QOUSTL(KSTOR) .EQ. 0.0)         TST0108
     *  GO TO 2120                                                     TST0109
      GO TO 2150                                                        TST0110
 2120   FON     = (QINST-QPUMP(KSTOR))/(QINST-QINSTL(KSTOR))           TST0111
        DSTART(KSTOR) = DEPTHZ*(1.0-FON) + FON*DEPTHL(KSTOR)            TST0112
        DTON(KSTOR)   = DTON(KSTOR) + FON                               TST0113
      WRITE(6,605)  DSTART(KSTOR), KSTOR                                TST0114
  605 FORMAT(' ', 60X, 'NEW DSTART =', F6.2, ' FT.',                    TST0115
     *       ', IN UNIT NO.', I3)                                       TST0116
C                                                                       TST0117
                                                                        TST0118
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 2150 IF (QOLSTL(KSTOR) .EQ. 0.0 .AND. DEPTHZ .GT. DSTART(KSTOR))        TSTO119
     *  GO TO 2200                                                      TSTO120
      IF (QOLSTL(KSTOR) .GT. 0.0 .AND. DEPTHZ .LT. DSTOP(KSTOR) )       TSTO121
     *  GO TO 2300                                                      TSTO122
        QOUST  = QOUSTL(KSTOR)                                         TSTO123
        VOLOUT(KSTOR,KTSTEP) = VOLOUZ                                  TSTO124
        STOR   = STORZ                                                 TSTO125
        DEPTH  = DEPTHZ                                                TSTO126
      GO TO 2500                                                       TSTO127
C                                                                      TSTO128
 2200   FON    = (DEPTHZ - DSTART(KSTOR))/(DEPTHZ - DEPTHL(KSTOR))     TSTO129
        QOUST  = QPUMP(KSTOR)                                          TSTO130
      GO TO 2400                                                       TSTO131
C                                                                      TSTO132
 2300   FON    = (DEPTHL(KSTOR) - DSTOP(KSTOR))/(DEPTHL(KSTOR) - DEPTHZ)TSTO133
        QOUST  = 0.0                                                   TSTO134
C                                                                      TSTO135
 2400 IF (FON .LT. 0.0)  GO TO 8100                                    TSTO136
        VOLOUT(KSTOR,KTSTEP) = FON*DT*QPUMP(KSTOR)                     TSTO137
        STOR   = STORL(KSTOR) + VOLIN(KSTOR,KTSTEP)-VOLOUT(KSTOR,KTSTEP)TSTO138
C                                                                      TSTO139
      CALL TINTRP(DUMSTR,DUMDEP,11,STOR,DEPTH,KFLAG)                   TSTO140
C                                                                      TSTO141
      IF (KFLAG .EQ. -10)  GO TO 901                                   TSTO142
      IF (KFLAG .EQ.  10)  GO TO 8000                                  TSTO143
C                                                                      TSTO144
 2500 IF (DEPTH .GT. DEPMAX(KSTOR))  GO TO 8000                        TSTO145
        CUMIN(KSTOR)  = CUMIN(KSTOR) + VOLIN(KSTOR,KTSTEP)             TSTO146
        CUMOUT(KSTOR) = CUMOUT(KSTOR) + VOLOUT(KSTOR,KTSTEP)           TSTO147
        QINSTL(KSTOR) = QINST                                          TSTO148
        QOUSTL(KSTOR) = QOUST                                          TSTO149
        DEPTHL(KSTOR) = DEPTH                                          TSTO150
        STORL(KSTOR)  = STOR                                           TSTO151
      IF (KTSTEP .EQ. NDT)  STORF(KSTOR) = STOR                        TSTO152
      IF (STOR .GT. STORMX(KSTOR))  STORMX(KSTOR) = STOR               TSTO153
      IF (QOUST .GT. 0.0)  DTON(KSTOR) = DTON(KSTOR) + 1.0             TSTO154
      GO TO 4000                                                       TSTO155
C-----------                                                           TSTO156
C                                                                      TSTO157
 3000 CALL TSROUT                                                      TSTO158
C                                                                      TSTO159
      IF (STOR .GT. STORMX(KSTOR))  STORMX(KSTOR) = STOR               TSTO160
C                                                                      TSTO161
      CALL TINTRP(DUMSTR,DUMDEP,11,STOR,DEPTH,KFLAG)                   TSTO162
C                                                                      TSTO163
      IF (KFLAG .EQ. -10)  GO TO 901                                   TSTO164
      IF (KFLAG .EQ.  10)  GO TO 8000                                  TSTO165
      IF (DEPTH .GT. DEPMAX(KSTOR))  GO TO 8000                        TSTO166
C                                                                      TSTO167
C                   COMPUTE SEDIMENT AND BOD OUTFLOW                   TSTO168
C                                                                      TSTO169
C                                                                      TSTO170
C                   DETERMINE PLUG FRACTIONS AND DETENTION TIMES       TSTO171
C                                                                      TSTO172
C                   CUMIN  = CUMULATIVE INFLOW (CU.FT.) SINCE T = 0    TSTO173
C                   CUMOUT = CUMULATIVE OUTFLOW (CU.FT.) SINCE T = 0   TSTO174
C                   SSIN   = SS INFLOW (LB) IN THIS TIME-STEP          TSTO175
C                   BODIN  = BOD INFLOW (LB) IN THIS TIME-STEP         TSTO176
C                   SBOD   = BOD (LB) IN RESERVOIR                     TSTO177
C                   SSS    = SS  (LB) IN RESERVOIR                     TSTO178
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C                    BODOUT = BOD OUTFLOW (LB)                                  TST0179
C                    SSOUT  = SS  OUTFLOW (LB)                                  TST0180
C                    BODCOT = BOD OUTFLOW CONC. (MG/L)                          TST0181
C                    SSCOUT = SS  OUTFLOW CONC. (MG/L)                          TST0182
C                    SBODC  = BOD CONC. (MG/L) AVG. IN RESERVOIR                TST0183
C                    SSSC   = SS  CONC. (MG/L) AVG. IN RESERVOIR                TST0184
C                    MG/L   = 16050*(LB/CU.FT.)                                 TST0185
C                                                                               TST0186
 3100 IF (KTSTEP .GT. 1)  GO TO 3200                                            TST0187
        VOLIN(KSTOR,1)  = 0.5*QINST*DT                                          TST0188
        VOLOUT(KSTOR,1) = 0.5*(QOUST+QOUTO(KSTOR))*DT                           TST0189
        CUMIN(KSTOR)    = VOLIN(KSTOR,1)                                        TST0190
        CUMOUT(KSTOR)   = VOLOUT(KSTOR,1)                                       TST0191
        SBOD(KSTOR)     = 0.0                                                   TST0192
        SSS(KSTOR)      = 0.0                                                   TST0193
        SCOL(KSTOR)     = 0.0                                                   TST0193A
        LPREV(KSTOR)    = 1                                                     TST0194
        JP              = 0                                                     TST0195
        LP              = 0                                                     TST0196
      GO TO 4000                                                                TST0197
 3200   VOLIN(KSTOR,KTSTEP)  = 0.5*(QINST+QINSTL(KSTOR))*DT                     TST0198
        VOLOUT(KSTOR,KTSTEP) = 0.5*(QOUST+QOUSTL(KSTOR))*DT                     TST0199
        CUMIN(KSTOR)  = CUMIN(KSTOR)  + VOLIN(KSTOR,KTSTEP)                     TST0200
        CUMOUT(KSTOR) = CUMOUT(KSTOR) + VOLOUT(KSTOR,KTSTEP)                    TST0201
C------------                                                                   TST0202
 4000 IF (IPOL(KSTOR) .EQ. 0)  GO TO 4400                                       TST0203
      IF (VOLOUT(KSTOR,KTSTEP) .LE. 0.0)  GO TO 4200                            TST0204
C                                                                               TST0205
      CALL TPLLGS                                                               TST0206
C                                                                               TST0207
      IF (LABEL .EQ. 5000)  GO TO 4200                                          TST0208
C                                                                               TST0209
C                    NOW HAVE, FOR EACH PLUG (FOR KP=JP,LP), ..                 TST0210
C                         FRAC(KP),DETENT(KP)                                   TST0211
C                                                                               TST0212
C                    MODEL ASSUMES..                                            TST0213
C                         NO SCOUR WITHIN BASIN                                 TST0214
C                                                                               TST0215
C                    BRANCH FOR TYPE OF BASIN FLOW (IPOL)                       TST0216
C                                                                               TST0217
        K = IPOL(KSTOR)                                                         TST0218
      GO TO (4100,4180), K                                                      TST0219
C                                                                               TST0220
C                    IPOL=1 ASSUMES 100% EFFICIENT PLUG FLOW                    TST0221
C                                                                               TST0222
 4100 DO 4150  KP=JP,LP                                                         TST0223
        BODOUT = BODOUT + BODIN(KSTOR,KP)*FRAC(KP)                              TST0224
        COLOUT = COLOUT + COLIN(KSTOR,KP)*FRAC(KP)                              TST0224A
 4150   SSOUT  = SSOUT  +  SSIN(KSTOR,KP)*FRAC(KP)                             TST0225
C                                                                               TST0226
        BODCOT = BODOUT*16050.0/VOLOUT(KSTOR,KTSTEP)                            TST0227
        SSCOUT = SSOUT *16050.0/VOLOUT(KSTOR,KTSTEP)                            TST0228
        COLCOT = COLOUT/(VOLOUT(KSTOR,KTSTEP)*283.2)                            TST0228A
      GO TO 4300                                                                TST0229
C                                                                               TST0230
C                    IPOL=2 ASSUMES 100% MIXING                                 TST0231
C                                                                               TST0232
C                    FOR THIS CASE, DON'T REALLY NEED SUBROUTINE TPLUGS,        TST0233
C                    OR (KTSTEP) ON VOLIN, VOLOUT, SSIN, BODIN                  TST0234
C                                                                               TST0235
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 4180   BODCOT = SBODC                                                        TST0236
        SSCOUT = SSSC                                                         TST0237
        COLCCT = SCOLC                                                        TST0237A
        BODOUT = BODCCT*VOLOUT(KSTOR,KTSTEP)/16050.0                          TST0238
        SSOUT  = SSCOUT*VOLOUT(KSTOR,KTSTEP)/16050.0                          TST0239
        COLOUT = COLCCT*VOLOUT(KSTOR,KTSTEP)*283.2                            TST0239A
      GO TO 4300                                                              TST0240
C                                                                             TST0241
 4200   BODCCT = 0.0                                                          TST0242
        SSCOUT = 0.0                                                          TST0243
        COLCCT = 0.0                                                          TST0243A
      IF (LPREV(KSTOR) .GT. 1)  GO TO 4300                                    TST0244
        LP = 0                                                                TST0245
        JP = 0                                                                TST0246
C                                                                             TST0247
 4300   SBOD(KSTOR)    = SBOD(KSTOR) - BODOUT + BODIN(KSTOR,KTSTEP)          TST0248
        SSS(KSTOR)     = SSS(KSTOR)  - SSOUT  +  SSIN(KSTOR,KTSTEP)          TST0249
        SCOL(KSTOR)    = SCOL(KSTOR) - COLOUT +  COLIN(KSTOR,KTSTEP)         TST0249A
      IF (STOR .EQ. 0.0)  GO TO 4350                                          TST0250
        SBODC  = SBOD(KSTOR)*16050.0/STOR                                     TST0251
        SSSC   = SSS(KSTOR) *16050.0/STOR                                     TST0252
        SCOLC  = SCOL(KSTOR)/(STOR*283.2)                                     TST0252A
      GO TO 4400                                                              TST0253
 4350   SBODC  = 0.0                                                          TST0254
        SSSC   = 0.0                                                          TST0255
        SCOLC  = 0.0                                                          TST0255A
C                                                                             TST0256
 4400 IF (IPRINT(KSTOR) .LT. 1)  GO TO 5300                                   TST0257
      IF (IPOL(KSTOR) .EQ. 0)  GO TO 5100                                     TST0258
C                                                                             TST0259
C                    PRINT SOLUTION FOR THIS TIME-STEP                        TST0260
C                                                                             TST0261
 5000 WRITE(6,606)  KSTOR,KTSTEP,TIME2M,QINST,QOUST,                          TST0262
     *              STOR,DEPTH,BODIN(KSTOR,KTSTEP),SSIN(KSTOR,KTSTEP),       TST0263
     *              SBOD(KSTOR),SSS(KSTOR),SBODC,SSSC,BODOUT,SSOUT,          TST0264
     *              BODCOT,SSCOUT,JP,LP                                      TST0265
  606 FORMAT(' ', I1, I3, F6.1, 2F7.1, F10.0, F6.2, 2X, 2F7.1, F10.1,         TST0266
     *       F9.1, 2F7.1, F5.1, 3F7.1, 2I4)                                   TST0267
      WRITE(6,666) CCLIN(KSTOR,KTSTEP),SCOL(KSTOR),SCOLC,COLOUT,COLCOT        TST0267A
  666 FORMAT(' ', 40X, 'COLIN= ', 1PE9.2, 'SCOL(MPN)=', E9.2,                 TST0267B
     *      'CONC=', E9.2, 'COLCUT=', E9.2, 'CONC=', E9.2)                    TST0267C
      GO TO 5200                                                              TST0268
 5100 WRITE(6,606)  KSTOR,KTSTEP,TIME2M,QINST,QOUST,                          TST0269
     *              STOR,DEPTH                                               TST0270
 5200 IF (KSTOR .EQ. NSTOR)  WRITE(6,604)                                     TST0271
 5300 IF (KSTOR .LT. NSTOR)  GO TO 5400                                       TST0272
      IF (KTSTEP .LT. NDT)  GO TO 5400                                        TST0273
      DO 5350  KSTDUM=1,NSTOR                                                 TST0274
      IF (IFLOOD(KSTDUM) .EQ. 1)  GO TO 5350                                  TST0275
      IF (IPRINT(KSTDUM) .LT. 1)  GO TO 5350                                  TST0276
      WRITE(6,607)  NDT, KSTDUM, CUMIN(KSTDUM), CUMOUT(KSTDUM)                TST0277
  607 FORMAT('0',  /, ' ', 26X, 'FOR THESE', I4, ' TIME STEPS ',               TST0278
     *       'IN STORAGE UNIT NO.', I3, /,                                    TST0279
     *       ' ', 36X, 'CUMULATIVE INFLOW  =', F12.0, ' CU.FT.', /,           TST0280
     *       ' ', 36X, 'CUMULATIVE OUTFLOW =', F12.0, ' CU.FT.')              TST0281
 5350 CONTINUE                                                                TST0282
 5400 GO TO 9999                                                              TST0283
C                                                                             TST0284
C------------------ ERROR MESSAGES ---------------------------------------TST0285
 8000 WRITE(6,691)                                                            TST0286
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  691 FORMAT(' ', 14X, 'UNIT HAS FLOODED - HYDROGRAPH TERMINATED')        TST0287
        IFLOOD(KSTOR) = 1                                                 TST0288
      GO TO 9999                                                          TST0289
C                                                                         TST0290
 8100 WRITE(6,692)                                                        TST0291
  692 FORMAT(' ', 14X, 'BUFFER VOLUME BETWEEN LEVELS DSTART AND DSTOP ',TST0292
     *       'IS TOO SMALL,', /,                                          TST0293
     *       ' ', 14X, 'RESULTING IN NEGATIVE VOLOUT (AND FUN).')        TST0294
        IFLOOD(KSTOR) = 1                                                 TST0295
      GO TO 9999                                                          TST0296
C                                                                         TST0297
  901 IF (KFLAG .EQ. 10)  GO TO 902                                       TST0298
      WRITE(6,693)                                                        TST0299
  693 FORMAT('0 *** TERMINATE - INPUT TO TINTRP PROCEDURE IS LESS THAN LTST0300
     *OWEST VALUE ON CURVE (IN SUBRT. STORAG)')                          TST0301
      STOP 9C1                                                            TST0302
C                                                                         TST0303
  902 WRITE(6,694)                                                        TST0304
  694 FORMAT('0 *** TERMINATE - INPUT TO TINTRP PROCEDURE IS GREATER THATST0305
     *N LARGEST VALUE ON CURVE (IN SUBRT. STORAG)')                      TST0306
      STOP 9C2                                                            TST0307
C                                                                         TST0308
 9999 RETURN                                                              TST0309
      END                                                                 TST0310
C=========================================================================TST0311
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      SUBROUTINE TSTCST                                                 TSTC  1
      COMMON/TABLES/KDEPTH(25),KLASS(25),PSIMAX(15),ALFMAX(15),         TSTC  2
     1              NN(25),MM(25),ANORM(15,51),QNORM(15,51),           TSTC  3
     2              DNORM(15,51),AFACT(15),RFACT(15)                   TSTC  4
      COMMON A(160,2,2) ,Q(160,2,2) , CPULL(160,2,2,3), QMAX(160),      TSTC  5X
     1       QFULL(160), AFULL(160), DXDT(160),C1(160), SLOPE(160),     TSTC  6
     2       DIST(160), GEOM1(160), ROUGH(160), NOE(160), NUE(160,3),   TSTC  7
     3       INUE(160,3), NTYPE(160), JR(160), NKLASS, NE, NDT, EPSIL,  TSTC  8
     4       TIME, DT, M, KFULL, N, NOS, NPULL, NPRINT, ITER,           TSTC  9
     5       QCWF(160), IOLD(160), P1(160), RNOFF(160), QINFIL(160),    TSTC 10
     6       WDWF(160,3), PLUTO(160,3), IR(160), P2(160), NIN(1000),    TSTC 11X
     7       P5(160),P6(160),P7(160),SCF(160),BARREL(160),              TSTC 12
     8       TITLE(40), NPE(20), NVN(20), NORDER(70), GEOM2(160),       TSTC 13X
     9       GEOM3(160) , P4(160),SCOUR(160), KSTORE(160)               TSTC 14
      COMMON  BODIN( 2,150),SSIN( 2,150),BODOUT,SSOUT,COLIN(2,150),     TSTC 15X
     *  QIAST,QCOST,QINSTL( 2),QOUSTL( 2),STORL( 2),QOUTO( 2),STORO( 2),TSTC 16
     *  NSTOR,KSTOR,IPRINT( 2),IPOL( 2),IFLOOD( 2),ICOST( 2),DEPMAX( 2),TSTC 17
     *  ATERM( 2,11),AO2DT2( 2,11),BDEPTH( 2,11),BSTOR( 2,11),COLOUT,   TSTC 18X
     *  DUMSTR(11),DUMDEP(11),                                          TSTC 19
     *  KTSTEP,VOLIN( 2,150),VOLOUT( 2,150),STOR,CUMIN( 2),CUMOUT( 2),  TSTC 20
     *  SBOD( 2),SSS( 2),SCOL( 2),                                      TSTC 21X
     *  ISTMOD( 2),ISTTYP( 2),ISTOUT( 2),                               TSTC 22
     *  QPUMP( 2),DSTART( 2),DSTOP( 2),                                 TSTC 23
     *  DTON( 2),STORMX( 2),DTPUMP( 2),DTMORE( 2),STORF( 2),APLAN( 2),  TSTC 24
     *  CLAND( 2),CSTOR( 2),CPS( 2),CTOTAL( 2),CPCUYD( 2),CPACRE( 2),   TSTC 25
     *  LP,JP,LPREV( 2),LABEL,DETENT(150),FRAC(150),OUT1(10,200)        TSTC 26X
C                                                                       TSTC 27X
      DIMENSION QO1(150),QO2(150)                                       TSTC 28
      EQUIVALENCE (QO1(1),QMAX(1)),(QO2(1),QFULL(1))                    TSTC 29
C                                                                       TSTC 30
      DO 9000  KSTOR=1,NSTOR                                            TSTC 31
      IF (ICCST(KSTOR) .LT.1)  GO TO 9000                               TSTC 32
C                                                                       TSTC 33
      WRITE(6,601)  KSTOR                                               TSTC 34
  601 FORMAT('1', 10X, 'SUMMARY OF STORAGE AND COSTS FOR UNIT NO.',I3,/)TSTC 35
      IF (IFLCCD(KSTOR) .EQ. 1)  GO TO 902                              TSTC 36
C                                                                       TSTC 37
        CLAND(KSTOR)  = CPACRE(KSTOR)*APLAN(KSTOR)/43560.0              TSTC 38
        CSTOR(KSTOR)  = CPCUYD(KSTOR)*STORMX(KSTOR)/27.0                TSTC 39
        CTOTAL(KSTOR) = CLAND(KSTOR) + CSTOR(KSTOR) + CPS(KSTOR)        TSTC 40
C                                                                       TSTC 41
C                     BRANCH TO OUTLET TYPE (ISTOUT)                    TSTC 42
C                                                                       TSTC 43
        K = ISTOUT(KSTOR)                                               TSTC 44
      GO TO (8000,8000, 901, 901,4600,4600, 901, 901), K                TSTC 45
C                                                                       TSTC 46
C------------------ COMPUTE AND PRINT STORAGE UNIT COSTS ---------------TSTC 47
C                                                                       TSTC 48
C                     F) OUTLET BY EXISTING PUMPS                       TSTC 49
C                                                                       TSTC 50
C                     FOLLOWING IS TEMPORARY, DOWN TO 8000              TSTC 51
C                                                                       TSTC 52
 4600   DTMORE(KSTOR) = STORF(KSTOR)/(QPUMP(KSTOR)*DT)                  TSTC 53
        DTPUMP(KSTOR) = DTON(KSTOR) - 1.0 + DTMORE(KSTOR)               TSTC 54
      WRITE(6,602)  DTMORE(KSTOR),DTPUMP(KSTOR)                         TSTC 55
  602 FORMAT('0', 15X, 'NO. TIMESTEPS PUMPED AFTER STORM, TO EMPTY, =', TSTC 56
     *                F12.2, /,                                         TSTC 57
     *       ' ', 15X, 'TOTAL NO. TIMESTEPS OUTFLOW WAS PUMPED      =', TSTC 58
     *                F12.2 )                                           TSTC 59
C                                                                       TSTC 60
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C                    Z) ALL OUTLETS
C
 8000 CONTINUE
      WRITE(6,603)  APLAN(KSTOR),STORMX(KSTOR),CPACRE(KSTOR),
     *              CLAND(KSTOR),CPCUYD(KSTOR),CSTOR(KSTOR),CPS(KSTOR),
     *              CTOTAL(KSTOR)
  603 FORMAT(' ', 15X, 'PLAN AREA OF RESERVOIR (LAND REQUIREMENT)    =',
     *                 F12.2, ' SQ.FT.', /,
     *        ' ', 15X, 'MAX. STORAGE VOLUME USED (CONSTRUC. REQT.)  =',
     *                 F12.2, ' CU.FT.', /,
     *        '0'. 15X, 'COST OF LAND, AT $',F7.0,'/ACRE . . . . . .= $',
     *                 F12.2, /,
     *        ' ', 15X, 'COST OF RESERVOIR, AT $',F5.2,
     *                 ' /CU.YD. . . .= $',F12.2, /,
     *        ' ', 15X, 'COST OF PUMP STN. & SPECIAL STRUCTURES . .= $',
     *                 F12.2, /,
     *        'C', 15X, 'TOTAL COST', 32X, '= $', F12.2)
C
 9000 CONTINUE
      GO TO 9999
C
C------------------ ERROR MESSAGES ------------------------------------
C
C
  901 WRITE(6,691)  ISTOUT(KSTOR), KSTOR
  691 FORMAT('0 *** ISTOUT =', I3, ', IN RESERVOIR NO.', I4,
     *        ', IS OF A TYPE NOT PRESENTLY MODELED')
      STOP
C
  902 WRITE(6,692)
  692 FORMAT('0', 10X, '***  UNIT FLOODED, SO SUMMARY IS INV LID')
C
 9999 RETURN
      END
C=====================================================================
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      SUBROUTINE TPLUGS                                                 TPLU  1
      COMMON/TABLES/KDEPTH(25),KLASS(25),PSIMAX(15),ALFMAX(15),         TPLU  2
     1              NN(25),MM(25),ANORM(15,51),QNORM(15,51),           TPLU  3
     2              DNORM(15,51),AFACT(15),RFACT(15)                   TPLU  4
      COMMON A(160,2,2) ,Q(160,2,2) , CPOLL(160,2,2,3), QMAX(160),      TPLU  5X
     1       CFULL(160), AFULL(160), DXDT(160),C1(160), SLOPE(160),     TPLU  6
     2       DIST(160), GEOM1(160), ROUGH(160), NUE(160), NUE(160,3),   TPLU  7
     3       INUE(160,3), NTYPE(160), JR(160), NKLASS, NE, NDT, EPSIL,  TPLU  8
     4       TIME, DT, M, KFULL, N, NOS, NPOLL, NPRINT, ITER,           TPLU  9
     5       QDWF(160), IOLD(160), P1(160), RNOFF(160), QINFIL(160),    TPLU 10
     6       WDWF(160,3), PLUTO(160,3), IR(160), P2(160), NIN(1000),    TPLU 11X
     7       P5(160),P6(160),P7(160),SCF(160),BARREL(160),              TPLU 12
     8       TITLE(40), NPE(20), NYN(20), NORDER(70), GEOM2(160),       TPLU 13X
     9       GEOM3(160) , P4(160),SCOUR(160), KSTORE(160)               TPLU 14
      COMMON  BODIN( 2,150),SSIN( 2,150),BODOUT,SSOUT,COLIN(2,150),     TPLU 15X
     *  QINST,COLST,QINSTL( 2),QOUSTL( 2),STORL( 2),QOUTO( 2),STORO( 2),TPLU 16
     *  NSTOR,KSTOR,IPRINT( 2),IPOL( 2),IFLOOD( 2),ICOST( 2),DEPMAX( 2),TPLU 17
     *  ATERM( 2,11),AO2DT2( 2,11),BDEPTH( 2,11),BSTOR( 2,11),COLOUT,   TPLU 18X
     *  DUMSTR(11),DUMDEP(11),                                          TPLU 19
     *  KTSTEP,VOLIN( 2,150),VOLOUT( 2,150),STOR,CUMIN( 2),CUMOUT( 2),  TPLU 20
     *  SBOD( 2),SSS( 2),SCCL( 2),                                      TPLU 21X
     *  ISTMOD( 2),ISTTYP( 2),ISTOUT( 2),                               TPLU 22
     *  QPUMP( 2),DSTART( 2),DSTOP( 2),                                 TPLU 23
     *  DTON( 2),STORMX( 2),DTPUMP( 2),DTMORE( 2),STORF( 2),APLAN( 2),  TPLU 24
     *  CLAND( 2),CSTOR( 2),CPS( 2),CTOTAL( 2),CPCUYD( 2),CPACRE( 2),   TPLU 25
     *  LP,JP,LPREV( 2),LABEL,DETENT(150),FRAC(150),OUT1(10,200)        TPLU 26X
C                                                                       TPLU 27X
      DIMENSION QC1(150),QC2(150)                                       TPLU 28
      EQUIVALENCE (QO1(1),QMAX(1)),(QO2(1),QFULL(1))                    TPLU 29
C                                                                       TPLU 30
C                   GIVEN KTSTEP, VOLIN, VOLOUT & STORE ARRAYS, KTSTEP &TPLU 31
C                   FINDS LP AND JP (NUMBERS OF FIRST AND LAST PART-PLUGTPLU 32
C                   COMPUTES DETENT AND FRAC ARRAYS (KP=JP,LP)          TPLU 33
C                   (SUBPROGRAM BY G.T.)                                TPLU 34
C                                                                       TPLU 35
        LABEL  = 0                                                      TPLU 36
        LP       = KTSTEP                                               TPLU 37
        JP       = LPREV(KSTOR)                                         TPLU 38
        VIKK   = VOLIN(KSTOR,KTSTEP)                                    TPLU 39
        VOKK   = VOLOUT(KSTOR,KTSTEP)                                   TPLU 40
        SUM1=C.0                                                        TPLU 40A
        SUM    = 0.0                                                    TPLU 41
 1000   SUM    = SUM + VOLIN(KSTOR,LP)                                  TPLU 42
        SUM1= SUM + VOKK - VIKK                                         TPLU 42A
        BACK = SUM1 - STOR                                              TPLU 43
      IF (BACK .GT. VOKK)  GO TO 1100                                   TPLU 44
      GO TO 1200                                                        TPLU 45
 1100   BACK = VOKK                                                     TPLU 46
 1200 IF(BACK) 1300,1400,2000                                           TPLU 47
 1300   LP       = LP - 1                                               TPLU 48
      IF(LP-1)  5000,1000,1000                                          TPLU 49
C                                                                       TPLU 50
 1400 WRITE(6,601)                                                      TPLU 51
  601 FORMAT('0 A PART-PLUG = 0.  EXECUTION TERMINATED.')               TPLU 52
      STOP 1400                                                         TPLU 53
C                                                                       TPLU 54
 2000 IF(VIKK .LE. 0.0)  GO TO 4000                                     TPLU 55
      IF(LP .EQ. KTSTEP)  GO TO 3000                                    TPLU 56
C                                                                       TPLU 57
C                   GENERAL CASE                                        TPLU 58
```

```
C                          A NUMBER OF PLUGS AND PART-PLUGS LEAVE
C
      IF(LP .EC. 1)  GO TO 2500
      IF(JP .GT. 1)  GO TO 2800
        NF      = JP + 1
      IF(NF .EC. LP)  GO TO 2600
        SOUT    = 0.0
        ML      = LP - 1
        NF      = JP + 1
      DO 2050  L=NF,ML
 2050   SOUT    = SOUT + VOLIN(KSTOR,L)
        SOUT    = SOUT + BACK
        STOT    = SOUT + VOLIN(KSTOR,JP)
      IF(STOT .GE. VOKK)  GO TO 2400
        FRAC(JP) = 1.0
 2100   RIJP    = KTSTEP - JP
        DETENT(JP) = RIJP*DT
      DO 2200  L=NF,ML
        FRAC(L)= 1.0
        RIL     = KTSTEP - L
 2200   DETENT(L) = RIL*DT
 2300   FRAC(LP)= BACK/VOLIN(KSTOR,LP)
        RILP    = KTSTEP - LP
        DETENT(LP) = RILP*DT
        LPREV(KSTOR)  = LP
      GO TO $$$$
C
 2400   FRONT  = VOKK - SOUT
        FRAC(JP)= FRONT/VOLIN(KSTOR,JP)
      GO TO 2100
C
 2500   FRONT  = VOKK - BACK
      GO TO 2300
C
 2600   SOUT   = BACK + VOLIN(KSTOR,JP)
      IF(SOUT .GE. VOKK)  GO TO 2700
        FRAC(JP)= 1.0
        RIJP    = KTSTEP - JP
        DETENT(JP) = RIJP*DT
      GO TO 2300
C
 2700   FRONT  = VOKK - BACK
        FRAC(JP)= FRONT/VOLIN(KSTOR,JP)
        RIJP    = KTSTEP - JP
        DETENT(JP) = RIJP*DT
      GO TO 2300
C
 2800 IF (LP .EQ. JP)  GO TO 4100
        NF      = JP + 1
      IF(NF .EQ. LP)  GO TO 2700
        SOUT    = 0.0
        ML      = LP - 1
      DO 2850  L=NF,ML
 2850   SOUT    = SOUT + VOLIN(KSTOR,L)
        SOUT    = SOUT + BACK
      GO TO 2400
C
C                    SPECIAL CASE
C                         INFLOW PLUG LARGER THAN BASIN VOLUME
C
```

```
TPLU 59
TPLU 60
TPLU 61
TPLU 62
TPLU 63
TPLU 64
TPLU 65
TPLU 66
TPLU 67
TPLU 68
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TPLU 70
TPLU 71
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TPLU111
TPLU112
TPLU113
TPLU114
TPLU115
TPLU116
TPLU117
TPLU118
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 3000 IF(LP .EC. 1)  GO TO 3700                                          TPLU119
      IF(JP .GT. 1)  GO TO 3800                                          TPLU120
        NF      = JP + 1                                                 TPLU121
      IF(NF .EC. LP)  GO TO 3500                                         TPLU122
        SOUT    = 0.0                                                    TPLU123
        ML      = LP - 1                                                 TPLU124
        NF      = JP + 1                                                 TPLU125
      DO 3050  L=NF,ML                                                   TPLU126
 3050   SOUT    = SOUT + VOLIN(KSTOR,L)                                  TPLU127
        SOUT    = SOUT + BACK                                            TPLU128
        STOT    = SOUT + VOLIN(KSTOR,JP)                                 TPLU129
      IF(STOT .GE. VOKK)  GO TO 3400                                     TPLU130
       FRAC(JP)= 1.0                                                     TPLU131
 3100   RIJP    = KTSTEP - JP                                            TPLU132
        DETENT(JP) = RIJP*DT                                             TPLU133
      DO 3200  L=NF,ML                                                   TPLU134
        FRAC(L)= 1.0                                                     TPLU135
        RIL     = KTSTEP - L                                             TPLU136
 3200   DETENT(L) = RIL*DT                                               TPLU137
 3300   FRAC(LP)= BACK/VOLIN(KSTOR,LP)                                   TPLU138
        DETENT(LP) = DT*STOR/VIKK                                        TPLU139
        LPREV(KSTOR)  = LP                                               TPLU140
      GO TO 9999                                                         TPLU141
C                                                                        TPLU142
 3400   FRONT   = VOKK - SOUT                                            TPLU143
        FRAC(JP)= FRONT/VOLIN(KSTOR,JP)                                  TPLU144
      GO TO 3100                                                         TPLU145
C                                                                        TPLU146
 3500   SOUT    = BACK + VOLIN(KSTOR,JP)                                 TPLU147
        RIJP    = KTSTEP - JP                                            TPLU148
        DETENT(JP) = RIJP*DT                                             TPLU149
      IF(SOUT .GE. VOKK)  GO TO 3600                                     TPLU150
        FRAC(JP)= 1.0                                                    TPLU151
      GO TO 3300                                                         TPLU152
C                                                                        TPLU153
 3600   FRONT   = VOKK - BACK                                            TPLU154
        FRAC(JP)= FRONT/VOLIN(KSTOR,JP)                                  TPLU155
      GO TO 3300                                                         TPLU156
C                                                                        TPLU157
 3700   FRONT   = VOKK - BACK                                            TPLU158
        FRAC(LP)= BACK/VIKK                                              TPLU159
        DETENT(LP) = DT*STOR/VIKK                                        TPLU160
        LPREV(KSTOR)  = LP                                               TPLU161
      GO TO 9999                                                         TPLU162
C                                                                        TPLU163
 3800 IF (LP .EQ. JP)  GO TO 4100                                        TPLU164
        NF      = JP + 1                                                 TPLU165
      IF(NF .EC. LP)  GO TO 3600                                         TPLU166
        SOUT    = 0.0                                                    TPLU167
        ML      = LP - 1                                                 TPLU168
      DO 3850  L=NF,ML                                                   TPLU169
 3850   SOUT    = SOUT + VOLIN(KSTOR,L)                                  TPLU170
        SOUT    = SOUT + BACK                                            TPLU171
        FRONT   = VOKK - SOUT                                            TPLU172
        FRAC(JP)= FRONT/VOLIN(KSTOR,JP)                                  TPLU173
      GO TO 3100                                                         TPLU174
C                                                                        TPLU175
C                    SPECIAL END CONDITION                               TPLU176
C                         NO INFLOW, OUTFLOW FROM STORAGE                TPLU177
C                                                                        TPLU178
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 4000 IF (LP .EQ. JP)  GO TO 4100                                          TPLU179
        NF      = JP + 1                                                   TPLU180
      IF(NF .EQ. LP)  GO TO 4200                                           TPLU181
        SOUT    = 0.0                                                      TPLU182
        ML      = LP - 1                                                   TPLU183
      DO 4050  L=NF,ML                                                     TPLU184
 4050   SOUT    = SOUT + VOLIN(KSTOR,L)                                    TPLU185
        SOUT    = SOUT + SUM - STOR                                        TPLU186
      GO TO 2400                                                           TPLU187
C                                                                          TPLU188
 4100   FRAC(LP)= BACK/VOLIN(KSTOR,LP)                                     TPLU189
        RILP    = KTSTEP - LP                                              TPLU190
        DETENT(LP) = RILP*DT                                               TPLU191
        LPREV(KSTOR)  = LP                                                 TPLU192
      GO TO 9999                                                           TPLU193
C                                                                          TPLU194
 4200   FRONT  = VOKK - BACK                                               TPLU195
        FRAC(JP)= FRONT/VOLIN(KSTOR,JP)                                    TPLU196
        RILP    = KTSTEP - LP                                              TPLU197
        DETENT(JP) = RILP*DT                                               TPLU198
      GO TO 2300                                                           TPLU199
C                                                                          TPLU200
 5000   LABEL  = 5000                                                      TPLU201
      GO TO 9999                                                           TPLU202
C                                                                          TPLU203
 9999 RETURN                                                               TPLU204
      END                                                                  TPLU205
C=============================================================================TPLU206
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```
      SUBROUTINE TSROUT                                                 TSRO  1
      COMMON/TABLES/KDEPTH(25),KLASS(25),PSIMAX(15),ALFMAX(15),         TSRO  2
     1              NN(25),MM(25),ANORM(15,51),QNORM(15,51),           TSRO  3
     2              DNORM(15,51),AFACT(15),RFACT(15)                   TSRO  4
      COMMON A(160,2,2) ,Q(160,2,2) , CPOLL(160,2,2,3), QMAX(160),      TSRO  5X
     1       QFULL(160), AFULL(160), DXDT(160),C1(160), SLOPE(160),     TSRO  6
     2       DIST(160), GEOM1(160), ROUGH(160), NOE(160), NUE(160,3),   TSRO  7
     3       IAUE(160,3), NTYPE(160), JR(160), NKLASS, NE, NDT, EPSIL,  TSRO  8
     4       TIME, DT, M, KFULL, N, NOS, NPULL, NPRINT, ITER,           TSRO  9
     5       QDWF(160), IOLD(160), P1(160), RNOFF(160), QINFIL(160),    TSRO 10
     6       WDWF(160,3), PLUTO(160,3), IR(160), P2(160), NIN(1000),    TSRO 11X
     7       P5(160),P6(160),P7(160),SCF(160),BARREL(160),              TSRO 12
     8       TITLE(40), NPE(20), NYN(20), NORDER(70), GEOM2(160),       TSRO 13X
     9       GEOM3(160) , P4(160),SCOUR(160), KSTORE(160)               TSRO 14
      COMMON  BODIN( 2,150),SSIN( 2,150),BODOUT,SSOUT,COLIN(2,150),     TSRO 15X
     *  QINST,COLST,QINSTL( 2),QOUSTL( 2),STORL( 2),QOUTO( 2),STORO( 2),TSRO 16
     *  NSTOR,KSTOR,IPRINT( 2),IPOL( 2),IFLOOD( 2),ICOST( 2),DEPMAX( 2),TSRO 17
     *  ATERM( 2,11),AO2DT2( 2,11),BDEPTH( 2,11),BSTOR( 2,11),COLOUT,   TSRO 18X
     *  DUMSTR(11),DUMDEP(11),                                          TSRO 19
     *  KTSTEP,VOLIN( 2,150),VOLOUT( 2,150),STOR,CUMIN( 2),CUMOUT( 2),  TSRO 20
     *  SBOD( 2),SSS( 2),SCCL( 2),                                      TSRO 21X
     *  ISTMOD( 2),ISTTYP( 2),ISTOUT( 2),                               TSRO 22
     *  QPUMP( 2),DSTART( 2),DSTOP( 2),                                 TSRO 23
     *  DTON( 2),STORMX( 2),DTPUMP( 2),DTMORE( 2),STORF( 2),APLAN( 2),  TSRO 24
     *  CLANC( 2),CSTOR( 2),CPS( 2),CTOTAL( 2),CPCUYD( 2),CPACRE( 2),   TSRO 25
     *  LP,JP,LPREV( 2),LABEL,DETENT(150),FRAC(150),OUT1(10,200)        TSRO 26X
C                                                                       TSRO 27X
      DIMENSION    DUMTRM(11),DUMAO2(11)                              TSRO 28
      DIMENSION QO1(150),QO2(150)                                     TSRO 29
      EQUIVALENCE (QO1(1),QMAX(1)),(QO2(1),QFULL(1))                  TSRO 30
C                                                                       TSRO 31
C                                                                       TSRO 32
C                          ONLY WORKS FOR ONE UNIT (KSTOR) AT A TIME    TSRO 33
C                    INPUTS ARE  DT, QINST, KSTOR, KTSTEP, STORO( 2),   TSRO 34
C                                QOUTO( 2), ATERM( 2,11), AO2DT2( 2,11) TSRO 35
C                    OUTPUTS ARE QOUST, STORE(100)                      TSRO 36
C                    NOTE..  ALL FLOWS ARE IN CFS.                      TSRO 37
C                                                                       TSRO 38
      IF (KTSTEP .GT. 1)  GO TO 1000                                    TSRO 39
C                                                                       TSRO 40
C                    INITIALISE                                         TSRO 41
C                                                                       TSRO 42
        QINSTL(KSTOR) = 0.0                                             TSRO 43
        QOUSTL(KSTOR) = QOUTO(KSTOR)                                    TSRO 44
        STORL(KSTOR)  = STORO(KSTOR)                                    TSRO 45
        DT2     = DT/2.0                                                TSRO 46
C                                                                       TSRO 47
 1000   TERM    = (QINSTL(KSTOR) + QINST)*DT2 - (QOUSTL(KSTOR)*DT2     TSRO 48
     *           - STORL(KSTOR))                                        TSRO 49
      IF (TERM .GE. 0.0)  GO TO 2000                                    TSRO 50
      WRITE(6,601)  TERM, KTSTEP                                        TSRO 51
  601 FORMAT(' ', '** RESET TERM =', F12.5, ' TO ZERO  ', I10)          TSRO 52
        TERM    = 0.0                                                   TSRO 53
C                                                                       TSRO 54
C                    FIND 'O2DT2' CORRESPONDING TO 'TERM' ABOVE,        TSRO 55
C                    BY LINEAR  INTRPOLATION.                           TSRO 56
C                                                                       TSRO 57
 2000 DO 2050  II=1,11                                                  TSRO 58
        DUMTRM(II) = ATERM(KSTOR,II)                                    TSRO 59
 2050   DUMAO2(II) = AO2DT2(KSTOR,II)                                   TSRO 60
```

```
C                                                                       TSRO 61
      CALL TINTRP(DUMTRM,DUMAO2,11,TERM,O2DT2,KFLAG)                    TSRO 62
C                                                                       TSRO 63
      IF  (KFLAG .NE. 0)  GO TO 901                                     TSRO 64
        STOR  = TERM - O2DT2                                            TSRO 65
        QOUST = O2DT2/DT2                                               TSRO 66
CC    WRITE(6,61)                                                       TSRO 67
      IF (ISTCUT(KSTOR).NE.9) GO TO 2200                                TSRO 68
C                                                                       TSRO 69
C                     COMPUTE OUTFLOW THROUGH ORIFICE.                  TSRO 70
C                                                                       TSRO 71
      DO 2100 II=1,11                                                   TSRO 72
 2100 DUMAO2(II) = OUT1(KSTOR,II)                                       TSRO 73
      CALL TINTRP(DUMTRM,DUMAO2,11,TERM,O2DT2,KFLAG)                    TSRO 74
      IF (KFLAG.NE.0) GO TO 901                                         TSRO 75
      QO1(M) = O2DT2/DT2                                                TSRO 76
      QO2(M) = QOUST-QO1(M)                                             TSRO 77
C                                                                       TSRO 78
C                     INITIALISE FOR NEXT TIME-STEP                     TSRO 79
C                                                                       TSRO 80
 2200 QINSTL(KSTOR) = QINST                                             TSRO 81
        QOUSTL(KSTOR) = QOUST                                           TSRO 82
        STORL(KSTOR)  = STOR                                            TSRO 83
      GO TO 9999                                                        TSRO 84
C                                                                       TSRO 85
C---------           ERROR MESSAGES                                     TSRO 86
C                                                                       TSRO 87
  901 IF (KFLAG .EQ. 10)  GO TO 902                                     TSRO 88
      WRITE(6,691)                                                      TSRO 89
  691 FORMAT('0 *** TERMINATE - INPUT TO TINTRP PROCEDURE IS LESS THAN LTSRO 90
     *OWEST VALUE ON CURVE (IN SUBRT. ROUTE)')                          TSRO 91
      STOP                                                              TSRO 92
C                                                                       TSRO 93
  902 WRITE(6,692)                                                      TSRO 94
  692 FORMAT('C *** TERMINATE - INPUT TO TINTRP PROCEDURE IS GREATER THATSRO 95
     *N LARGEST VALUE ON CURVE (IN SUBRT. ROUTE)')                      TSRO 96
      STOP                                                              TSRO 97
C                                                                       TSRO 98
 9999 RETURN                                                            TSRO 99
      END                                                               TSRO100
C=======================================================================TSRO101
```

```
      SUBRCUTINE TINTRP(X, Y, L, XE, YE, K)                                 TINT  1
      DIMENSION X(L),Y(L)                                                   TINT  2
C                                                                           TINT  3
C                     GIVEN XE,  INTRPOLATES LINEARLY FOR YE                TINT  4
C                     FLAGS M/PROG WITH K-VALUE, IF XE OUTSIDE RANGE        TINT  5
C                     ( FROM MCCRACKEN, PP. 61-64 )                         TINT  6
C                                                                           TINT  7
      IF (XE .GE. X(1) )  GO TO 2000                                        TINT  8
C                                                                           TINT  9
C                     XE IS .LT. LOWEST VALUE ON CURVE                      TINT 10
 1000   K  = -10                                                            TINT 11
      GO TO 9999                                                            TINT 12
C                                                                           TINT 13
C                     SEARCH FOR SMALLEST X(J) .GT. XE                      TINT 14
 2000 DO 2050  J=2,L                                                        TINT 15
      IF (XE-X(J) )  4000,3000,2050                                         TINT 16
 2050 CONTINUE                                                              TINT 17
C                     XE IS .GT. LARGEST VALUE ON CURVE                     TINT 18
C                                                                           TINT 19
        K  = 10                                                             TINT 20
      GO TO 9999                                                            TINT 21
C                                                                           TINT 22
C                     XE COINCIDES WITH AN X(J), SO  INTRPOLATION UNNECESSTINT 23
 3000   YE = Y(J)                                                          TINT 24
      GO TO 5000                                                            TINT 25
C                                                                           TINT 26
C                     NOW X(J) IS THE SMALLEST VALUE .GT. XE.               TINT 27
C                     COMPUTE YE BY LINEAR INTERPOLATION.                   TINT 28
C                                                                           TINT 29
 4000   YE = Y(J-1) + (Y(J)-Y(J-1))*(XE-X(J-1))/(X(J)-X(J-1))               TINT 30
 5000   K  = 0                                                             TINT 31
C                                                                           TINT 32
 9999 RETURN                                                                TINT 33
      END                                                                   TINT 34
```

```
      FUNCTICN ACOS(X)                                                  ACOS  1
      ARG = (1.0 - X) / (1.0 + X)                                       ACOS  2
      TARG = SCRT(ARG)                                                  ACOS  3
      ACOS = 2.0 * ATAN(TARG)                                           ACOS  4
      RETURN                                                            ACOS  5
      END                                                               ACOS  6
```

```
      BLOCK DATA                                                        DATA  1
C     TYPE=01    CIRCULAR CONDUIT                                       DATA  2
C     TYPE=02    RECTANGULAR CONDUIT                                    DATA  3
C     TYPE=03    EGG-SHAPED CONDUIT                                     DATA  4
C     TYPE=04    HORSESHOE CONDUIT                                      DATA  5
C     TYPE=05    GOTHIC SHAPED CONDUIT                                  DATA  6
C     TYPE=06    CATENARY CONDUIT                                       DATA  7
C     TYPE=07    SEMI ELLIPTICAL CONDUIT                                DATA  8
C     TYPE=08    BASKET-HANDLE CONDUIT                                  DATA  9
C     TYPE=09    SEMI-CIRCULAR CONDUIT                                  DATA 10
C     TYPE=10    MODIFIED BASKET-HANDLE CONDUIT                         DATA 11
C     TYPE=11    RECTANGULAR CONDUIT (TRIANGULAR BOTTOM)                DATA 12
C     TYPE=12    RECTANGULAR CONDUIT (ROUND BOTTOM)                     DATA 13
C     TYPE=13    USER SUPPLIED                                          DATA 14
C     TYPE=14    USER SUPPLIED                                          DATA 15
C     TYPE=15    USER SUPPLIED                                          DATA 16
C     TYPE=16    MANHOLE                                                DATA 17
C     TYPE=17    LIFT STATION                                           DATA 18
C     TYPE=18    FLOW DIVIDER                                           DATA 19
C     TYPE=19    STORAGE UNIT                                           DATA 20
C     TYPE=20    FLOW DIVIDER                                           DATA 21
C     TYPE=21    FLOW DIVIDER                                           DATA 22
C     TYPE=22    BACKWATER ELEMENT                                      DATA 23
C     TYPE=23                                                           DATA 24
C     TYPE=24                                                           DATA 25
C     TYPE=25                                                           DATA 26
      COMMON/NAMES/ NAME(4,20),NAME2(4,5),GNO,YES,BLANK                 DATA 27
      COMMON/TABLES/KDEPTH(25),KLASS(25),PSIMAX(15),ALFMAX(15),         DATA 28
     1              NN(25),MM(25),ANORM(15,51),QN1(120),QN2(120),       DATA 29
     2              QN3(120),QN4(120),QN5(120),QN6(120),QN7(45),        DATA 30
     3              DN1(120),DN2(120),DN3(120),DN4(120),DN5(120),       DATA 31
     4              DN6(120),DN7(45),AFACT(15),RFACT(15)                DATA 32
      DATA NAME/4HCIRC,4HULAR,4H SHA,4HPED ,                            DATA 33
     *          4HRECT,4HANGU,4HLAR ,4H    ,                           DATA 34
     *          4HEGG-,4HSHAP,4HED  ,4H    ,                           DATA 35
     *          4HHORS,4HE SH,4HOE  ,4H    ,                           DATA 36
     *          4HGOTH,4HIC S,4HHAPE,4HD   ,                           DATA 37
     *          4HCATE,4HNARY,4H SHA,4HPED ,                           DATA 38
     *          4HSEMI,4H ELL,4HIPTI,4HCAL ,                           DATA 39
     *          4HBASK,4HET H,4HANDL,4HE   ,                           DATA 40
     *          4HSEMI,4H CIR,4HCULA,4HR   ,                           DATA 41
     *          4HMODI,4HFIED,4H B. ,4HH.  ,                           DATA 42
     *          4HRECT,4H. - ,4HTRIA,4HNG. ,                           DATA 43
     *          4HRECT,4H. - ,4HROUN,4HD   ,                           DATA 44
     *          4H USE,4HR SU,4HPPLI,4HED  ,                           DATA 45
     *          4H USE,4HR SU,4HPPLI,4HED  ,                           DATA 46
     *          4H USE,4HR SU,4HPPLI,4HED  ,                           DATA 47
     *          4HMANH,4HOLE ,4H    ,4H    ,                           DATA 48
     *          4HLIFT,4H STA,4HTION,4H    ,                           DATA 49
     *          4HFLOW,4H DIV,4HIDER,4H    ,                           DATA 50
     *          4HSTOR,4HAGE ,4HUNIT,4H    ,                           DATA 51
     *          4HFLOW,4H DIV,4HIDER,4H    /                           DATA 52
      DATA NAME2/4HFLOW,4H DIV,4HIDER,4H    ,                          DATA 53
     *          4HBACK,4HWATE,4HR UN,4HIT  ,                           DATA 54
     *          4H    ,4H    ,4H    ,4H    ,                           DATA 55
     *          4H    ,4H    ,4H    ,4H    ,                           DATA 56
     *          4H    ,4H    ,4H    ,4H    /                           DATA 57
      DATA GNO/4HNO  /, YES/4HYES /, BLANK/4H                           DATA 58
       DATA KDEPTH/2,1,7*2,3*1,3*2,10*3/                                DATA 59
       DATA  KLASS/2,1,7*2,3*1,3*2,10*3/                                DATA 60
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      DATA NN/51,1,7*51,6*1,10*0/                                          DATA 61
      DATA MM/51,1,7*51,6*1,10*0/                                          DATA 62
      DATA ALFMAX/.96,.97,.96,.96,.96,.98,.98,.96,.96,3*.98,3*.96/         DATA 63
      DATA PSIMAX/1.08,.9505,1.065,1.077,1.065,1.05,1.045,1.06078,         DATA 64
     1 1.06637,6*1.0/                                                      DATA 65
     DATA AFACT/0.7853982,0.0,0.5105,0.8293,0.6554,0.70277,0.785,0.7862DATA 66
     1,1.2697,6*0.0/,RFACT/0.25,0.0,0.1931,0.2538,0.2269,0.23172,0.242, DATA 67
     2 0.2464,0.2546,6*0.0/                                                DATA 68
      DATA ANCRM/15*0.0,15*.02,15*.04,15*.06,15*.08,15*.10,15*.12,         DATA 69
     *     15*.14,15*.16,15*.18,15*.20,15*.22,15*.24,15*.26,15*.28,       DATA 70
     *           15*.30,15*.32,15*.34,15*.36,15*.38,15*.40,15*.42,        DATA 71
     *           15*.44,15*.46,15*.48,15*.50,15*.52,15*.54,15*.56,        DATA 72
     *           15*.58,15*.60,15*.62,15*.64,15*.66,15*.68,15*.70,        DATA 73
     *           15*.72,15*.74,15*.76,15*.78,15*.80,15*.82,15*.84,        DATA 74
     *           15*.86,15*.88,15*.90,15*.92,15*.94,15*.96,15*.98,        DATA 75
     *           15*1.0/                                                  DATA 76
      DATA CN1/0.0    ,0.0    ,0.0    ,0.0    ,0.0    ,0.0    ,0.0    ,DATA 77
     *         0.0    ,0.0    ,0.0    ,0.0    ,4*0.0,                    DATA 78
     *         0.00526,0.0    ,0.00295,0.00467,0.00500,0.00605,0.00438,DATA 79
     *         0.00758,0.00757,0.0    ,0.0    ,4*0.0,                    DATA 80
     *         0.01414,0.0    ,0.01331,0.01237,0.01740,0.01455,0.01227,DATA 81
     *         0.01812,0.01815,0.0    ,0.0    ,4*0.0,                    DATA 82
     *         0.02553,0.0    ,0.02629,0.02268,0.03098,0.02540,0.02312,DATA 83
     *         0.03000,0.03000,0.0    ,0.0    ,4*0.0,                    DATA 84
     *         0.03862,0.0    ,0.04000,0.03515,0.04272,0.03863,0.03638,DATA 85
     *         0.03966,0.03580,0.0    ,0.0    ,4*0.0,                    DATA 86
     *         0.05315,0.0    ,0.05657,0.04943,0.05500,0.05430,0.05145,DATA 87
     *         0.04957,0.04037,0.0    ,0.0    ,4*0.0,                    DATA 88
     *         0.06877,0.0    ,0.07500,0.06525,0.06980,0.07127,0.05783,DATA 89
     *         0.06230,0.04601,0.0    ,0.0    ,4*0.0,                    DATA 90
     *         0.08551,0.0    ,0.09432,0.08212,0.08620,0.08778,0.08500,DATA 91
     *         0.07849,0.05500,0.0    ,0.0    ,4*0.0/                    DATA 92
      DATA CN2/0.10326,0.0    ,0.11473,0.10005,0.10461,0.10372,0.10093,DATA 93
     *         0.09618,0.07475,0.0    ,0.0    ,4*0.0,                    DATA 94
     *         0.12195,0.0    ,0.13657,0.11891,0.12463,0.12081,0.11752,DATA 95
     *         0.11416,0.09834,0.0    ,0.0    ,4*0.0,                    DATA 96
     *         0.14144,0.0    ,0.15894,0.13856,0.14500,0.14082,0.13530,DATA 97
     *         0.13094,0.12500,0.0    ,0.0    ,4*0.0,                    DATA 98
     *         0.16162,0.0    ,0.18030,0.15896,0.16309,0.16375,0.15626,DATA 99
     *         0.14808,0.15570,0.0    ,0.0    ,4*0.0,                    DATA100
     *         0.18251,0.0    ,0.20036,0.18004,0.18118,0.18779,0.17917,DATA101
     *         0.16583,0.18588,0.0    ,0.0    ,4*0.0,                    DATA102
     *         0.20410,0.0    ,0.22000,0.20172,0.20000,0.21157,0.20296,DATA103
     *         0.18381,0.20883,0.0    ,0.0    ,4*0.0,                    DATA104
     *         0.22636,0.0    ,0.23919,0.22397,0.22181,0.23478,0.22654,DATA105
     *         0.20294,0.22300,0.0    ,0.0    ,4*0.0,                    DATA106
     *         0.24918,0.0    ,0.25896,0.24677,0.24487,0.25818,0.24962,DATA107
     *         0.22500,0.23472,0.0    ,0.0    ,4*0.0/                    DATA108
      DATA CN3/0.27246,0.0    ,0.28000,0.27006,0.26888,0.28244,0.27269,DATA109
     *         0.25470,0.24667,0.0    ,0.0    ,4*0.0,                    DATA110
     *         0.29614,0.0    ,0.30504,0.29380,0.29380,0.30741,0.29568,DATA111
     *         0.28532,0.26758,0.0    ,0.0    ,4*0.0,                    DATA112
     *         0.32027,0.0    ,0.33082,0.31790,0.31901,0.33204,0.31848,DATA113
     *         0.31006,0.29346,0.0    ,0.0    ,4*0.0,                    DATA114
     *         0.34485,0.0    ,0.35551,0.34237,0.34389,0.35505,0.34152,DATA115
     *         0.32804,0.32124,0.0    ,0.0    ,4*0.0,                    DATA116
     *         0.36989,0.0    ,0.37692,0.36720,0.36564,0.37465,0.36500,DATA117
     *         0.34555,0.35000,0.0    ,0.0    ,4*0.0,                    DATA118
     *         0.39531,0.0    ,0.39809,0.39239,0.38612,0.39404,0.38941,DATA119
     *         0.36944,0.37720,0.0    ,0.0    ,4*0.0,                    DATA120
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*          0.42105,0.0     ,0.42000,0.41792,0.40720,0.41426,0.41442,DATA121
*          0.40032,0.40540,0.0     ,0.0     ,4*0.0,                  DATA122
*          0.44704,0.0     ,0.44625,0.44374,0.43000,0.43804,0.44000,DATA123
*          0.43203,0.43541,0.0     ,0.0     ,4*0.0/                  DATA124
  DATA QN4/0.47329,0.0     ,0.47321,0.46984,0.45868,0.46531,0.46636,DATA125
*          0.46004,0.46722,0.0     ,0.0     ,4*0.0,                  DATA126
*          0.49980,0.0     ,0.50000,0.49619,0.48895,0.49357,0.49309,DATA127
*          0.47849,0.50000,0.0     ,0.0     ,4*0.0,                  DATA128
*          0.52658,0.0     ,0.52255,0.52276,0.52000,0.52187,0.52000,DATA129
*          0.49591,0.53532,0.0     ,0.0     ,4*0.0,                  DATA130
*          0.55354,0.0     ,0.54481,0.54950,0.55032,0.54925,0.54628,DATA131
*          0.51454,0.56935,0.0     ,0.0     ,4*0.0,                  DATA132
*          0.58064,0.0     ,0.56785,0.57640,0.58040,0.57647,0.57285,DATA133
*          0.53810,0.60000,0.0     ,0.0     ,4*0.0,                  DATA134
*          0.60777,0.0     ,0.59466,0.60345,0.61000,0.60321,0.60000,DATA135
*          0.56711,0.61544,0.0     ,0.0     ,4*0.0,                  DATA136
*          0.63499,0.0     ,0.62485,0.63065,0.63762,0.62964,0.62949,DATA137
*          0.60000,0.62811,0.0     ,0.0     ,4*0.0,                  DATA138
*          0.66232,0.0     ,0.65518,0.65795,0.66505,0.66039,0.65877,DATA139
*          0.64092,0.64170,0.0     ,0.0     ,4*0.0/                  DATA140
  DATA QN5/0.68995,0.0     ,0.68181,0.68531,0.69290,0.68472,0.68624,DATA141
*          0.68136,0.66598,0.0     ,0.0     ,4*0.0,                  DATA142
*          0.71770,0.0     ,0.70415,0.71271,0.72342,0.71425,0.71017,DATA143
*          0.71259,0.70010,0.0     ,0.0     ,4*0.0,                  DATA144
*          0.74538,0.0     ,0.72585,0.74009,0.75467,0.74303,0.73304,DATA145
*          0.73438,0.73413,0.0     ,0.0     ,4*0.0,                  DATA146
*          0.77275,0.0     ,0.74819,0.76738,0.78500,0.76827,0.75578,DATA147
*          0.75500,0.76068,0.0     ,0.0     ,4*0.0,                  DATA148
*          0.79979,0.0     ,0.77482,0.79451,0.81165,0.79168,0.77925,DATA149
*          0.78625,0.78027,0.0     ,0.0     ,4*0.0,                  DATA150
*          0.82658,0.0     ,0.80515,0.82144,0.83654,0.81500,0.80368,DATA151
*          0.81880,0.80000,0.0     ,0.0     ,4*0.0,                  DATA152
*          0.85320,0.0     ,0.83534,0.84814,0.86000,0.84094,0.83114,DATA153
*          0.85000,0.82891,0.0     ,0.0     ,4*0.0,                  DATA154
*          0.87954,0.0     ,0.86193,0.87450,0.88253,0.86707,0.85950,DATA155
*          0.86790,0.85564,0.0     ,0.0     ,4*0.0/                  DATA156
  DATA QN6/0.90546,0.0     ,0.88465,0.90057,0.90414,0.89213,0.88592,DATA157
*          0.88483,0.89000,0.0     ,0.0     ,4*0.0,                  DATA158
*          0.93095,0.0     ,0.90690,0.92652,0.92500,0.91607,0.90848,DATA159
*          0.90431,0.91270,0.0     ,0.0     ,4*0.0,                  DATA160
*          0.95577,0.0     ,0.93000,0.95244,0.94486,0.94000,0.93000,DATA161
*          0.93690,0.93664,0.0     ,0.0     ,4*0.0,                  DATA162
*          0.97976,0.0     ,0.95866,0.97724,0.96475,0.96604,0.95292,DATA163
*          0.97388,0.96677,0.0     ,0.0     ,4*0.0,                  DATA164
*          1.00291,0.0     ,0.98673,0.99988,0.98567,0.99000,0.97481,DATA165
*          1.00747,1.00000,0.0     ,0.0     ,4*0.0,                  DATA166
*          1.02443,0.0     ,1.01238,1.02048,1.00833,1.00714,0.99374,DATA167
*          1.03300,1.02661,0.0     ,0.0     ,4*0.0,                  DATA168
*          1.04465,0.0     ,1.03396,1.03989,1.03000,1.02158,1.01084,DATA169
*          1.05000,1.04631,0.0     ,0.0     ,4*0.0,                  DATA170
*          1.06135,0.0     ,1.05000,1.05698,1.05360,1.03814,1.02858,DATA171
*          1.05464,1.05726,0.0     ,0.0     ,4*0.0/                  DATA172
  DATA QN7/1.08208,0.0     ,1.06517,1.07694,1.06500,1.05000,1.04543,DATA173
*          1.06078,1.06637,0.0     ,0.0     ,4*0.0,                  DATA174
*          1.07662,0.0     ,1.05380,1.07562,1.05500,1.05000,1.05000,DATA175
*          1.05500,1.06000,0.0     ,0.0     ,4*0.0,                  DATA176
*          1.00000,0.0     ,1.00000,1.00000,1.00000,1.00000,1.00000,DATA177
*          1.00000,1.00000,0.0     ,0.0     ,4*0.0/                  DATA178
  DATA QN1/0.0     ,0.0     ,0.0     ,0.0     ,0.0     ,0.0     ,0.0     ,DATA179
*          0.0     ,0.0     ,0.0     ,0.0     ,4*0.0,                  DATA180
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*          0.05273,0.0     ,0.05584,0.04146,0.05112,0.04500,0.04808,DATA181
*          0.04112,0.04102,0.0     ,0.0     ,4*0.0,                 DATA182
*          0.08574,0.0     ,0.01952,0.07033,0.02896,0.04686,0.05584,DATA183
*          0.07380,0.07407,0.0     ,0.0     ,4*0.0,                 DATA184
*          0.24194,0.0     ,0.05590,0.09098,0.02312,0.02576,0.04056,DATA185
*          0.10000,0.10000,0.0     ,0.0     ,4*0.0,                 DATA186
*          0.41581,0.0     ,0.16479,0.10962,0.07904,0.01584,0.01952,DATA187
*          0.12236,0.11769,0.0     ,0.0     ,4*0.0,                 DATA188
*          0.15280,0.0     ,0.19490,0.12921,0.15000,0.05192,0.01000,DATA189
*          0.14141,0.13037,0.0     ,0.0     ,4*0.0,                 DATA190
*          0.16653,0.0     ,0.20000,0.14813,0.17576,0.10024,0.05952,DATA191
*          0.15857,0.14036,0.0     ,0.0     ,4*0.0,                 DATA192
*          0.18598,0.0     ,0.22500,0.16701,0.19288,0.15000,0.12056,DATA193
*          0.17462,0.15000,0.0     ,0.0     ,4*0.0/                 DATA194
   DATA DN2/0.20799,0.0     ,0.25000,0.18565,0.21000,0.17042,0.16510,DATA195
*          0.18546,0.16546,0.0     ,0.0     ,4*0.0,                 DATA196
*          0.23186,0.0     ,0.27312,0.20401,0.23000,0.18599,0.18659,DATA197
*          0.20315,0.18213,0.0     ,0.0     ,4*0.0,                 DATA198
*          0.25386,0.0     ,0.29482,0.22211,0.25000,0.20000,0.20000,DATA199
*          0.21557,0.20000,0.0     ,0.0     ,4*0.0,                 DATA200
*          0.27118,0.0     ,0.31454,0.23998,0.27067,0.21995,0.21524,DATA201
*          0.22833,0.22018,0.0     ,0.0     ,4*0.0,                 DATA202
*          0.28900,0.0     ,0.33276,0.25769,0.29058,0.24011,0.22872,DATA203
*          0.24230,0.24030,0.0     ,0.0     ,4*0.0,                 DATA204
*          0.30658,0.0     ,0.35000,0.27524,0.30754,0.25892,0.24108,DATA205
*          0.25545,0.25788,0.0     ,0.0     ,4*0.0,                 DATA206
*          0.32349,0.0     ,0.36697,0.29265,0.32099,0.27595,0.25296,DATA207
*          0.27936,0.27216,0.0     ,0.0     ,4*0.0,                 DATA208
*          0.34017,0.0     ,0.38357,0.30990,0.33297,0.29214,0.26500,DATA209
*          0.30000,0.28500,0.0     ,0.0     ,4*0.0/                 DATA210
   DATA DN3/0.35666,0.0     ,0.40000,0.32704,0.34431,0.30802,0.27784,DATA211
*          0.32040,0.29704,0.0     ,0.0     ,4*0.0,                 DATA212
*          0.37298,0.0     ,0.41697,0.34406,0.35653,0.32372,0.29212,DATA213
*          0.34034,0.30892,0.0     ,0.0     ,4*0.0,                 DATA214
*          0.38915,0.0     ,0.43372,0.36101,0.37009,0.33894,0.30970,DATA215
*          0.35852,0.32128,0.0     ,0.0     ,4*0.0,                 DATA216
*          0.40521,0.0     ,0.45000,0.37790,0.38451,0.35315,0.32982,DATA217
*          0.37595,0.33476,0.0     ,0.0     ,4*0.0,                 DATA218
*          0.42117,0.0     ,0.46374,0.39471,0.40000,0.36557,0.35000,DATA219
*          0.39214,0.35000,0.0     ,0.0     ,4*0.0,                 DATA220
*          0.43704,0.0     ,0.47747,0.41147,0.41810,0.37833,0.36738,DATA221
*          0.40802,0.36927,0.0     ,0.0     ,4*0.0,                 DATA222
*          0.45284,0.0     ,0.49209,0.42818,0.43648,0.39230,0.38390,DATA223
*          0.42372,0.38963,0.0     ,0.0     ,4*0.0,                 DATA224
*          0.46858,0.0     ,0.50989,0.44484,0.45374,0.40970,0.40000,DATA225
*          0.43894,0.41023,0.0     ,0.0     ,4*0.0/                 DATA226
   DATA CN4/0.48430,0.0     ,0.53015,0.46147,0.46805,0.42982,0.41667,DATA227
*          0.45315,0.43045,0.0     ,0.0     ,4*0.0,                 DATA228
*          0.50000,0.0     ,0.55000,0.47807,0.48195,0.45000,0.43333,DATA229
*          0.46557,0.45000,0.0     ,0.0     ,4*0.0,                 DATA230
*          0.51572,0.0     ,0.56429,0.49468,0.49626,0.46769,0.45000,DATA231
*          0.47833,0.46769,0.0     ,0.0     ,4*0.0,                 DATA232
*          0.53146,0.0     ,0.57675,0.51134,0.51352,0.48431,0.46697,DATA233
*          0.49230,0.48431,0.0     ,0.0     ,4*0.0,                 DATA234
*          0.54723,0.0     ,0.58834,0.52803,0.53190,0.50000,0.48372,DATA235
*          0.50545,0.50000,0.0     ,0.0     ,4*0.0,                 DATA236
*          0.56305,0.0     ,0.60000,0.54474,0.55000,0.51466,0.50000,DATA237
*          0.52936,0.51443,0.0     ,0.0     ,4*0.0,                 DATA238
*          0.57892,0.0     ,0.61441,0.56138,0.56416,0.52886,0.51374,DATA239
*          0.55000,0.52851,0.0     ,0.0     ,4*0.0,                 DATA240
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*          0.59487,0.0     ,0.62967,0.57804,0.57787,0.54292,0.52747,DATA241
*          0.57000,0.54271,0.0     ,0.0     ,4*0.0/                  DATA242
  DATA DN5/0.61093,0.0     ,0.64582,0.59478,0.59224,0.55729,0.54209,DATA243
*          0.59000,0.55774,0.0     ,0.0     ,4*0.0,                  DATA244
*          0.62710,0.0     ,0.66368,0.61171,0.60950,0.57223,0.55950,DATA245
*          0.61023,0.57388,0.0     ,0.0     ,4*0.0,                  DATA246
*          0.64342,0.0     ,0.68209,0.62881,0.62941,0.58780,0.57941,DATA247
*          0.63045,0.59101,0.0     ,0.0     ,4*0.0,                  DATA248
*          0.65991,0.0     ,0.70000,0.64609,0.65000,0.60428,0.60000,DATA249
*          0.65000,0.60989,0.0     ,0.0     ,4*0.0,                  DATA250
*          0.67659,0.0     ,0.71463,0.66350,0.67064,0.62197,0.62000,DATA251
*          0.66756,0.63005,0.0     ,0.0     ,4*0.0,                  DATA252
*          0.69350,0.0     ,0.72807,0.68111,0.69055,0.64047,0.64000,DATA253
*          0.68413,0.65000,0.0     ,0.0     ,4*0.0,                  DATA254
*          0.71068,0.0     ,0.74074,0.69901,0.70721,0.65980,0.66000,DATA255
*          0.70000,0.66682,0.0     ,0.0     ,4*0.0,                  DATA256
*          0.72816,0.0     ,0.75296,0.71722,0.72031,0.67976,0.68000,DATA257
*          0.71481,0.68318,0.0     ,0.0     ,4*0.0/                  DATA258
  DATA DN6/0.74602,0.0     ,0.76500,0.73583,0.73286,0.70000,0.70000,DATA259
*          0.72984,0.70000,0.0     ,0.0     ,4*0.0,                  DATA260
*          0.76424,0.0     ,0.77784,0.75490,0.74632,0.71731,0.71843,DATA261
*          0.74579,0.71675,0.0     ,0.0     ,4*0.0,                  DATA262
*          0.78297,0.0     ,0.79212,0.77447,0.76432,0.73769,0.73865,DATA263
*          0.76417,0.73744,0.0     ,0.0     ,4*0.0,                  DATA264
*          0.80235,0.0     ,0.80945,0.79471,0.78448,0.76651,0.76365,DATA265
*          0.78422,0.76651,0.0     ,0.0     ,4*0.0,                  DATA266
*          0.82240,0.0     ,0.82936,0.81564,0.80421,0.80000,0.79260,DATA267
*          0.80477,0.80000,0.0     ,0.0     ,4*0.0,                  DATA268
*          0.84353,0.0     ,0.85000,0.83759,0.82199,0.82090,0.82088,DATA269
*          0.82532,0.82090,0.0     ,0.0     ,4*0.0,                  DATA270
*          0.86563,0.0     ,0.86731,0.86067,0.84363,0.84311,0.85000,DATA271
*          0.85000,0.84311,0.0     ,0.0     ,4*0.0,                  DATA272
*          0.88970,0.0     ,0.88769,0.88557,0.87423,0.87978,0.88341,DATA273
*          0.88277,0.87978,0.0     ,0.0     ,4*0.0/                  DATA274
  DATA DN7/0.91444,0.0     ,0.91400,0.91159,0.90617,0.91576,0.90998,DATA275
*          0.91500,0.91576,0.0     ,0.0     ,4*0.0,                  DATA276
*          0.94749,0.0     ,0.95000,0.94520,0.93827,0.95000,0.93871,DATA277
*          0.95000,0.95000,0.0     ,0.0     ,4*0.0,                  DATA278
*          1.00000,0.0     ,1.00000,1.00000,1.00000,1.00000,1.00000,DATA279
*          1.00000,1.00000,0.0     ,0.0     ,4*0.0/                  DATA280
  END                                                                 DATA281
```

Section 4

STORAGE BLOCK

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BLOCK DATA		

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```
      SUBROUTINE STORAG                                                      STOR  1
C                                                                            STOR  2
C     ME TREATMENT MODEL 3, 23 AUG. 1970.     (EJF)     (T-STEP BASIS)     STOR  3
C                                                                            STOR  4
C                        AVAILABLE SYSVOLS:   WATFOR = 08-12,14-16          STOR  5
C                                             FORTH  = 08-12,14-15,17-99    STOR  6
C                                                                            STOR  7
C                   THIS M/PROG TO BE CALLED SUBROUTINE STORAG BY EXEC MSTOR  8
C                                                                            STOR  9
      COMMON  CONVER,KHOUR,KMIN,L,KMOD,NFLAG,BIG,HEAD1,HEAD2,                STOR 10
     *  QDESYN,QQIF,WAOU(7),WAIN(7),QQOU(7),QQIN(7),WARM(7),QQRL,            STOR 11
     *  BDIF,QQRM(7),BDOU(7),BDIN(7),BCOU(7),BCIN(7),BDRL,                   STOR 12
     *  SSIF,SSIN(7),SSOU(7),SCOU(7),SCIN(7),SSRM(7),SSRL,COIF,CORL,         STOR 13
     *  ADEPTH(11),AASURF(11),ITREAT(7),ISTOR,IPRINT,ICOST,HPFD,             STOR 14
     *  MODSIZ,ICHEM,ICL2,SCREEN,QQIFMX,DESF,IRANGE,KNTOF,TRIBA,SEDA,        STOR 15
     *  SQM,SREFFH,BREFFH,NUNITH,UAREAH,UPRAMA,ICHEMH,HM,VOLDAF,ITABLE,      STOR 16
     *  MODCST,TOTCST,RECIRC,OVRDAF,TSURFA,OVRSED,NSED,JM(7),WTRMT5,         STOR 17
     *  NSCRN,SCRCAP,SUAREA,FAREAB,NMS,AREAMS,VOLCON,VOLSED,ALJMUT,          STOR 18
     *  BDINT(7),SSINT(7),WAINT(7),BDOUT(7),SSOUT(7),WAOUT(7),               STOR 19
     *  WARMT(7),BDRMT(7),SSRMT(7),CHEMUT(8),CL2UT(8),QMOD(20),WTRMT1,       STOR 20
     *  QQRMT(7),QQOUT(7),QQRMMX(7),QQOUMX(7),QQRMMN(7),QQOUMN(7),           STOR 21
     *  BCRMT(7),BCOUT(7),BCRMMX(7),BCOUMX(7),BCRMMN(7),BCOUMN(7),           STOR 22
     *  SCRMT(7),SCOUT(7),SCRMMX(7),SCOUMX(7),SCRMMN(7),SCOUMN(7),           STOR 23
     *  BDRM(7),BCRM(7),SCRM(7)                                              STOR 24
      COMMON  /TBLK/DT,NDT,KDT                                               STOR 25
      COMMON  /BLK1/NAME(4,21)                                               STOR 26
      COMMON  /BLK2/QQARR(150),BDARR(150)                                    STOR 27
      COMMON  /BLK3/JS,JNS,NPOLL,SSARR(150),COARR(150),POLL(160,5,5),        STOR 28
     *              QQ(160,5)                                               STOR 29
      DIMENSION  TIME(160),TITLE(40),JN(5),TYTLE(20)                         STOR 30
      DATA  TYTLE / 4HOUTP, 4HUT F, 4HROM , 4HEXTE,                          STOR 31
     *              4HRNAL, 4H STO, 4HRAGE, 4H/TRE,                          STOR 32
     *              4HATME, 4HNT M, 4HODEL, 4HS    ,                         STOR 33
     *              4H    , 4H    , 4H    , 4H    ,                         STOR 34
     *              4H    , 4H    , 4H    , 4H    /                         STOR 35
        NSTIN = 10                                                           STOR 36
        NSTOUT = 11                                                          STOR 37
C                   READ FROM DISK                                           STOR 38
      REWIND NSTIN                                                           STOR 39
      READ(NSTIN)  (TITLE(I),I=1,40)                                         STOR 40
      DO 50  I=21,40                                                         STOR 41
   50   TITLE(I) = TYTLE(I-20)                                              STOR 42
      WRITE(06,601)  (TITLE(I),I=1,40)                                       STOR 43
  601 FORMAT(' ', 20A4)                                                      STOR 44
      WRITE(NSTOUT)  (TITLE(I), I=1,40)                                      STOR 45
      READ(NSTIN)  NDT,NOUTS,NPOLL,DT,TZERO,TRIBA                            STOR 46
      WRITE(NSTOUT)  NDT,NOUTS,NPOLL,DT,TZERO,TRIBA                          STOR 47
      READ(NSTIN)  (JN(N),N=1,NOUTS)                                         STOR 48
      WRITE(06,603)  (JN(J),J=1,NOUTS)                                       STOR 49
  603 FORMAT('0', 20X, 'TRANSPORT MODEL OUTFALLS AT THE FOLLOWING ',         STOR 50
     *       'ELEMENT NUMBERS:', /, ' ', 25X, 5I7)                           STOR 51
      WRITE(NSTOUT)  (JN(J),J=1,NOUTS)                                       STOR 52
C                   READ FROM CARD                                           STOR 53
      READ(05,500)  JNS                                                      STOR 54
  500 FORMAT(11C)                                                            STOR 55
C                   FIND OUTFLOW DATA FOR SELECTED EXT. ELEM. OF TRANSP.     STOR 56
      DO 1000  J=1,NOUTS                                                     STOR 57
 1000 IF(JN(J) .EQ. JNS)  GO TO 2000                                         STOR 58
      WRITE(06,699)  JNS                                                     STOR 59
  699 FORMAT('0THE SELECTED EXTERNAL ELEMENT NUMBER,',                       STOR 60
```

```
     *       13, ', IS NOT AVAILABLE FROM THE TRANSPORT MODEL',          STOR 61
     *       ' OUTPUT.  EXECUTION TERMINATED.')                          STOR 62
      STOP                                                               STOR 63
 2000   JS = J                                                           STOR 64
      WRITE(6,611)  JNS                                                  STOR 65
  611 FORMAT('0', 20X, 'INPUT TO TREATMENT MODEL SUPPLIED FROM ',        STOR 66
     *                 'TRANSPORT MODEL EXTERNAL ELEMENT NUMBER', I3)    STOR 67
C                   JN    = EXT. ELEM. NOS. OF TRANSPORT MODEL OUTFALLS  STOR 68
C                   NOUTS = NO. OF OUTFALLS FROM TRANSPORT MODEL         STOR 69
C                   JNS   = JN OF OUTFALL TO BE TREATED                  STOR 70
C                   JS    = NO. OF OUTFALL FROM TRANS. MOD. TO BE TREATESTOR 71
C                   NPOLL = NO. OF POLLUTANTS                            STOR 72
C                   TRIBA = TOTAL TRIBUTARY AREA (ACRES)                 STOR 73
      READ(5,501)  NRUNS, DESF                                           STOR 74
  501 FORMAT(I10, F10.2)                                                 STOR 75
        DT     = DT/60.0                                                 STOR 76
        CONVER = 1000000./(DT*60.*62.4)                                  STOR 77
        QQIFMX = 0.0                                                     STOR 78
C                   NRUNS = NO. OF DIFF. TREATMENT EXECS. TO BE RUN      STOR 79
C                           WITH TRANSPORT OUTPUT DATA                   STOR 80
C                   DESF = QDESYN/QQIFMX                                 STOR 81
C                      FOR DESIGN STORM, SPECIFY DESF (PROGRAM FINDS QDESTOR 82
C                      FOR OTHER STORMS, READ IN QDESYN (SET DESF .LE. 0STOR 83
C                                                                        STOR 84
      WRITE(6,600)  NRUNS, DT, NDT, TRIBA, NOUTS, NPOLL, TZERO           STOR 85
  600 FORMAT('0', //, 'ONUMBER OF RUNS             =', I10, /,           STOR 86
     *                'OTIME-STEP SIZE             =', F10.2, ' MIN,', /,STOR 87
     *                'ONO. TIME-STEPS MODELED     =',  I10, /,          STOR 88
     *                'OTRIBUTARY AREA             =', F10.2, ' ACRES',/,STOR 89
     *                'ONO. TRANSP. MOD. OUTFALLS =', I10, /,            STOR 90
     *                'ONO. OF POLLUTANTS          =', I10, /,           STOR 91
     *                'OTIME ZERO                  =', F10.1, ' SEC')    STOR 92
C                                                                        STOR 93
C                   NRUNS  = NO. OF TREATMENT SIMULATION RUNS MADE, THISSTOR 94
C                   DT     = TIME-STEP SIZE (MIN)                        STOR 95
C                   NDT    = NO. OF TIME-STEPS TO BE MODELED             STOR 96
C                   KDT = TIME-STEP NUMBER                               STOR 97
C                                                                        STOR 98
C------------------ READ INPUT HYDROGRAPHS AND POLLUTOGRAPHS -----------STOR 99
C                                                                        STOR100
C                   STANDARD UNITS FOR INPUT ARE CFS, LB/MIN & MPN/MIN   STOR101
 1100 DO 2222 KDT=1,NDT                                                  STOR102
      READ(NSTIN)  TIME(KDT),(QO(KDT,J),J=1,NOUTS),                     STOR103
     *             ((POLL(KDT,K,J),J=1,NOUTS),K=1,NPOLL)                STOR104
C                   STANDARD UNITS FOR INTERNAL COMPUTATIONS ARE         STOR105
C                       CFS, MG/L, CU.FT/DT, LB/DT, MPN/100ML, MPN/DT    STOR106
        QQARR(KDT) = QO(KDT,JS)                                          STOR107
        BOARR(KDT) = POLL(KDT,1,JS)*DT                                   STOR108
        SSARR(KDT) = POLL(KDT,2,JS)*DT                                   STOR109
        COARR(KDT) = POLL(KDT,3,JS)*DT                                   STOR110
      IF (QQARR(KDT) .GT. QQIFMX)  QQIFMX = QQARR(KDT)                   STOR111
 2222 CONTINUE                                                           STOR112
 3000 DO 7777  KRUN=1,NRUNS                                              STOR113
      WRITE(6,677)  KRUN                                                 STOR114
  677 FORMAT('1-------  RUN NO.', I2, '  -------')                       STOR115
C                                                                        STOR116
C------------------ READ, CALC. AND WRITE ALL TREATMENT UNIT CHARACTERISSTOR117
C                                                                        STOR118
      CALL TRTCAT                                                        STOR119
C                                                                        STOR120
```

```
      IF (NFLAG .EQ. 0)  GO TO 9999                                          STOR121
C                                                                            STOR122
C---------------------- FEED HYDROGRAPH(S) TO STORAGE UNIT(S) ---------------STOR123
C                                                                            STOR124
C                                                                            STOR125
C                     4000-6666 IS MAIN DRIVING LOOP                         STOR126
C                                                                            STOR127
 4000 DO 6666  KDT=1,NDT                                                     STOR128
C                                                                            STOR129
CCC                   IF STORAGE UNIT HAS FLOODED, TREAT SHOULDN'T BE CALL   STOR130
        QQIF = CQARR(KDT)                                                    STOR131
        BDIF = BDARR(KDT)                                                    STOR132
        SSIF = SSARR(KDT)                                                    STOR133
        COIF = COARR(KDT)                                                    STOR134
C                                                                            STOR135
      CALL TREAT                                                             STOR136
C                                                                            STOR137
        QO(KDT,JS)      = QQRL                                               STOR138
        POLL(KDT,1,JS) = BDRL/DT                                             STOR139
        POLL(KDT,2,JS) = SSRL/DT                                             STOR140
        POLL(KDT,3,JS) = CORL/DT                                             STOR141
CCC                   PRINT TABLES & WRITE OUTPUTS ON TAPE (DISC - IN ORIG   STOR142
C                     ***  -  PRESENTLY ONLY FOR RUN 1                       STOR143
      IF (KRUN .EQ. 1)  WRITE(NSTOUT)  TIME(KDT),(QO(KDT,J),J=1,NOUTS),      STOR144
     *                  ((POLL(KDT,K,J),J=1,NOUTS),K=1,NPOLL)                STOR145
 6666 CONTINUE                                                               STOR146
      IF (ITABLE .EQ. 1)  CALL SPRINT                                        STOR147
C                                                                            STOR148
      CALL TRCOST                                                            STOR149
C                                                                            STOR150
 7777 CONTINUE                                                               STOR151
C                                                                            STOR152
 8000 WRITE(6,900)                                                           STOR153
  900 FORMAT('1 ')                                                           STOR154
C                                                                            STOR155
      GO TO 9999                                                             STOR156
C                                                                            STOR157
C------------------ ERROR MESSAGES ----------------------------------------STOR158
C                                                                            STOR159
CC    GO TO 9999                                                             STOR160
C                                                                            STOR161
 9999 RETURN                                                                 STOR162
      END                                                                    STOR163
C============================================================================STOR164
```

```
      SUBROUTINE TRTDAT                                                 TRTD  1
      COMMON  CONVER,KHOUR,KMIN,L,KMOD,NFLAG,BIG,HEAD1,HEAD2,           TRTD  2
     *  QDESYR,QQIF,WAOU(7),WAIN(7),QQOU(7),QQIN(7),WARM(7),QQRL,       TRTD  3
     *  BDIF,QQRM(7),BDOU(7),BDIN(7),BCOU(7),BCIN(7),BDRL,              TRTD  4
     *  SSIF,SSIN(7),SSOU(7),SCOU(7),SCIN(7),SSRM(7),SSRL,COIF,CORL,    TRTD  5
     *  ADEPTH(11),AASURF(11),ITREAT(7),ISTOR,IPRINT,ICOST,HRFD,        TRTD  6
     *  MODSIZ,ICHEM,ICL2,SCREEN,QQIFMX,DESF,IRANGE,KNTOF,TRIBA,SEDA,   TRTD  7
     *  SQM,SREFFH,BREFFH,NUNITH,UAREAH,OPRAMA,ICHEMH,HM,VOLDAF,ITABLE, TRTD  8
     *  MODCST,TOTCST,RECIRC,OVRDAF,TSURFA,OVRSED,NSED,JM(7),WTRMTS,    TRTD  9
     *  NSCRN,SCRCAP,SUAREA,FAREAB,NMS,AREAMS,VOLCON,VOLSED,ALJMUT,     TRTD 10
     *  BDINT(7),SSINT(7),WAINT(7),BDOUT(7),SSOUT(7),WAOJT(7),          TRTD 11
     *  WARMT(7),BDRMT(7),SSRMT(7),CHEMUT(8),CL2UT(8),QMOD(20),WTRMT),  TRTD 12
     *  QQRMT(7),QQOUT(7),QQRMMX(7),QQOUMX(7),QQRMMN(7),QQOUMN(7),      TRTD 13
     *  BCRMT(7),BCOUT(7),BCRMMX(7),BCOUMX(7),BCRMMN(7),BCOUMN(7),      TRTD 14
     *  SCRMT(7),SCOUT(7),SCRMMX(7),SCOUMX(7),SCRMMN(7),SCOUMN(7),      TRTD 15
     *  BDRM(7),BCRM(7),SCRM(7)                                         TRTD 16
      COMMON  /TBLK/DT,NDT,KDT                                          TRTD 17
      COMMON  /BLK1/NAME(4,21)                                          TRTD 18
      COMMON  /BLK2/QQARR(150),BDARR(150)                               TRTD 19
      COMMON  /STBK/QIN(150),BODIN(150),SUSIN(150),COLIN(150),          TRTD 20
     *  QINST,QOUST,QINSTL,COUSTL,STORL,QOUTO,STORO,                    TRTD 21
     *  ISPRIM,IPOL,DEPMAX,QCMAX,DEPTH,                                 TRTD 22
     *  ATERM(11),AO2DT2(11),BDEPTH(11),BSTOR(11),                      TRTD 23
     *  DUMSTR(11),DUMDEP(11),                                          TRTD 24
     *  VOLIN(150),VOLOUT(150),STOR,CUMIN,CUMOUT,                       TRTD 25
     *  SBOD,SSS,SCOL,BODOUT,SUSOUT,COLOUT,                             TRTD 26
     *  ISTMOD,ISTTYP,ISTOUT,                                           TRTD 27
     *  QPUMP,DSTART,DSTOP,                                             TRTD 28
     *  DTON,STORMX,DTPUMP,DTMORE,STORF,APLAN,                          TRTD 29
     *  CLAND,CSTOR,CPS,CTOTAL,CPCUYD,CPACRE,                           TRTD 30
     *  LP,JP,LPREV,LABEL,DETENT(150),FRAC(150)                         TRTD 31
                                                                        TRTD 32
C                                                                       TRTD 33
      WRITE(6,601)                                                      TRTD 34
  601 FORMAT('0INPUT DATA FOR TREATMENT PACKAGE FOLLOWS')               TRTD 35
      READ(5,501)  ISTOR, (ITREAT(K), K=1,7)                            TRTD 36
  501 FORMAT(1015)                                                      TRTD 37
C                                                                       TRTD 38
C                     NOTE..   OPERATIONAL OPTIONS INDICATED BY '*'     TRTD 39
C                                                                       TRTD 40
C                     ISTOR      = INDICATOR TO SEPARATE STORAGE MODELING TRTD 41
C                  *             = 01 = NONE                            TRTD 42
C                                = 02 = FLOW THRU STORAGE MODELED SEPARATELTRTD 43
C                     ITREAT(1) = TREATMENT PARAMETER (LEVEL 1 = BAR RACKSTRTD 44
C                  *             = 11 = NO BAR RACKS (BYPASS)           TRTD 45
C                  *             = 12 = BAR RACKS                       TRTD 46
C                     ITREAT(2) = TREATMENT PARAMETER (LEVEL 2 = INLET PUMTRTD 47
C                  *             = 21 = GRAVITY = NO PUMPING (BYPASS)   TRTD 48
C                                = 22 = PUMPING (STATION)               TRTD 49
C                     ITREAT(3) = TREATMENT PARAMETER (LEVEL 3 = PRIMARY) TRTD 50
C                  *             = 31 = NONE (BYPASS)                   TRTD 51
C                  *             = 32 = DISSOLVED AIR FLOATATION        TRTD 52
C                  *             = 33 = FINE SCREENS & DISS AIR FLOATATION TRTD 53
C                  *             = 34 = FINE SCREENS (ONLY)             TRTD 54
C                  *             = 35 = SEDIMENTATION                   TRTD 55
C                     ITREAT(4) = TREATMENT PARAMETER (LEVEL 4 = SECONDARYTRTD 56
C                  *             = 41 = NONE (BYPASS)                   TRTD 57
C                  *             = 42 = MICROSTRAINERS                  TRTD 58
C                  *             = 43 = HIGH RATE FILTERS               TRTD 59
C                     ITREAT(5) = TREATMENT PARAMETER (LEVEL 5 = EFFLUENT TRTD 60
C                  *             = 51 = NO EFFLUENT SCREENS
```

```
C                 *                = 52 = EFFLUENT SCREENS
C                     ITREAT(6) = TREATMENT PARAMETER (LEVEL 6 = OUTLET PU
C                 *                = 61 = GRAVITY = NO PUMPING (BYPASS)
C                                  = 62 = PUMPING (STATION)
C                     ITREAT(7) = TREATMENT PARAMETER (LEVEL 7 = CL2 CONTA
C                 *                = 71 = NO CONTACT TANK (BYPASS)
C                 *                = 72 = CONTACT TANK
C
      WRITE(6,602)  ISTOR, (NAME(I,ISTOR), I=1,4)
  602 FORMAT('0',   ///,
     *       '0', 27X,  'CHARACTISTICS OF THE TREATMENT PACKAGE ARE', /,
     *       'C', 32X, 'LEVEL', 5X, 'MODE', 10X, 'PROCESS', //,
     *       'C', 34X,   '0',   8X,  '0',  I1, 8X, 4A4)
      DO 20  L=1,7
        LR  = ITREAT(L) - L*10
C
      GO TO (1,2,3,4,5.6,7), L
C
    1   J1     = LR + 2
        JM(1) = J1
      GO TO 8
    2   J2     = LR + 4
        JM(2) = J2
      GO TO 8
    3   J3     = LR + 6
      IF (LR .EQ. 5 .AND. ISTOR .EQ. 2)  J3 = 21
        JM(3) = J3
      GO TO 8
    4   J4     = LR + 11
        JM(4) = J4
      GO TO 8
    5   J5     = LR + 14
        JM(5) = J5
      GO TO 8
    6   J6     = LR + 16
        JM(6) = J6
      GO TO 8
    7   J7     = LR + 18
        JM(7) = J7
C
    8   J      = JM(L)
C
      IF (LR .EQ. 1)  GO TO 10
      WRITE(6,603)  L, ITREAT(L), (NAME(I,J), I=1,4)
  603 FORMAT(' ', 34X, I1, 8X, I2, 8X, 4A4)
      GO TO 20
   10 WRITE(6,604)  L,  ITREAT(L)
  604 FORMAT(' ', 34X, I1, 8X, I2, 29X, '(BYPASS)')
   20 CONTINUE
C
      CALL TRCHEK
C
   30 IF (NFLAG .EQ. 0)  GO TO 9999
C
C                     IPRINT = 0 = NO PRINTOUT EACH TIME-STEP (SUMMARY POS
C                            = 1 = PRINTOUT SOLUTION EACH TIME-STEP (QUANT
C                            = 2 = PRINTOUT SOLUTION EACH TIME-STEP (QUALI
C                     ICOST  = 0 = NO COST COMPUTATIONS AND SUMMARY
C                            = 1 = COMPUTE COSTS AND SUMMARIZE
C                     IRANGE = 0 = QUANTITY RANGES (MAX,AV,MIN) NOT SUMMAR
```

```
C                          = 1 = QUANTITY RANGES (MAX,AV,MIN) SUMMARIZEDTRTD121
C                  ITABLE = 0 = INFLOWS,OUTFLOWS NOT SUMMARIZED IN FINATRTD122
C                          = 1 = INFLOWS AND OUTFLOWS SUMMARIZED IN FINATRTD123
C                                                                       TRTD124
      READ(5,502)   IPRINT, ICOST, IRANGE, ITABLE                       TRTD125
  502 FORMAT(4I10)                                                      TRTD126
      WRITE(6,605)   IPRINT, ICOST, IRANGE, ITABLE                      TRTD127
  605 FORMAT('0', 75X, ' IPRINT =', I2, ',  ICOST =', I2, ',  IRANGE =',TRTD128
     *       I2, ',   ITABLE =', I2)                                    TRTD129
        KPASS = 0                                                       TRTD130
      IF (DESF .LE. 0.0)  GO TO 50                                      TRTD131
        QDESYN = QQIFMX*DESF                                            TRTD132
      WRITE(6,608)  QDESYN, DESF, QQIFMX                                TRTD133
  608 FORMAT('0', //, '0',  5X, 'DESIGN STORM USED.',                   TRTD134
     *       '  TREATMENT CAPACITY WILL BE SELECTED TO SUIT.', //,      TRTD135
     *       '0', 15X, 'DESIGN FLOWRATE =', F10.2, ' CFS.', /,         TRTD136
     *       ' ', 20X, '(=' F6.3, ' TIMES MAXIMUM ARRIVAL RATE OF',    TRTD137
     *       F10.2, ' CFS.)')                                          TRTD139
      GO TO 60                                                          TRTD139
   50 READ(5,503)  QDESYN                                               TRTD140
  503 FORMAT(F10.2)                                                     TRTD141
   55 WRITE(6,609)  QDESYN                                              TRTD142
  609 FORMAT('C',  5X, 'SPECIFIED TREATMENT CAPACITY USED.',/,          TRTD143
     *       '0', 15X, 'DESIGN FLOWRATE =', F10.2, ' CFS.')            TRTD144
   60 IF (ITREAT(3) .GT. 31)  GO TO 70                                  TRTD145
      IF (ITREAT(4) .GT. 41)  GO TO 70                                  TRTD146
      IF (ITREAT(5) .GT. 51)  GO TO 70                                  TRTD147
        KMOD = 1                                                        TRTD148
        QMOD(1) = QDESYN/1.547                                          TRTD149
      GO TO 90                                                          TRTD150
   70   QDSMGD = QDESYN/1.547                                           TRTD151
C                                                                       TRTD152
C                    SEARCH FOR SMALLEST MODULE SIZE (MGD) .GT. QDSMGD  TRTD153
C                                                                       TRTD154
        QMOD(1)  =   5.0                                                TRTD155
        QMOD(2)  =  10.0                                                TRTD156
        QMOD(3)  =  15.0                                                TRTD157
        QMOD(4)  =  20.0                                                TRTD158
        QMOD(5)  =  25.0                                                TRTD159
        QMOD(6)  =  30.0                                                TRTD160
        QMOD(7)  =  35.0                                                TRTD161
        QMOD(8)  =  50.0                                                TRTD162
        QMOD(9)  =  75.0                                                TRTD163
        QMOD(10) = 100.0                                                TRTD164
        QMOD(11) = 125.0                                                TRTD165
        QMOD(12) = 150.0                                                TRTD166
        QMOD(13) = 200.0                                                TRTD167
        QMOD(14) = 250.0                                                TRTD168
        QMOD(15) = 300.0                                                TRTD169
        QMOD(16) = 350.0                                                TRTD170
        QMOD(17) = 400.0                                                TRTD171
        QMOD(18) = 450.0                                                TRTD172
        QMOD(19) = 500.0                                                TRTD173
      DO 75  K=1,19                                                     TRTD174
      IF (QMOD(K) - QDSMGD)  75,80,80                                   TRTD175
   75 CONTINUE                                                          TRTD176
      GO TO 903                                                         TRTD177
   80   QDESYN = 1.547*QMOD(K)                                          TRTD178
        KMOD   = K                                                      TRTD179
      IF (KMOD .LT.  8)  GO TO 49                                       TRTD180
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      IF (KMCD .LT. 13)  GO TO 51                                          TRTD181
      IF (KMCD .LT. 20)  GO TO 52                                          TRTD182
      GO TO 903                                                            TRTD183
C                                                                          TRTD184
   49   MODSIZ = 5                                                         TRTD185
        NOUNIT = QMOD(KMOD)/5.0 + 0.1                                      TRTD186
      GO TO 53                                                             TRTD187
C                                                                          TRTD188
   51   MODSIZ = 25                                                        TRTD189
        NOUNIT = QMOD(KMOD)/25.0 + 0.1                                     TRTD190
      GO TO 53                                                             TRTD191
C                                                                          TRTD192
   52   MODSIZ = 50                                                        TRTD193
        NOUNIT = QMOD(KMOD)/50.0 + 0.1                                     TRTD194
C                                                                          TRTD195
   53   CONTINUE                                                           TRTD196
      WRITE(6,680)  QDESYN, QMOD(KMOD), KMOD                               TRTD197
  680 FORMAT(' ', 15X, 'TREATMENT SYSTEM INCLUDES MODULE UNITS', /,        TRTD198
     *       ' ', 20X, 'DESIGN FLOW IS THEREFORE INCREASED TO NEXT',       TRTD199
     *       ' LARGEST MODULE SIZE', /,                                    TRTD200
     *       ' ', 20X, 'ADJUSTED DESIGN FLOWRATE =', F10.2, ' CFS., =',    TRTD201
     *       F10.2, ' MGD.', /, ' ', 20X, '(KMOD =', I3, ')')              TRTD202
   90 CONTINUE                                                             TRTD203
C                                                                          TRTD204
C                    FIND CHLORINATOR CAPACITY REQUIRED = PCL2MX (LB/DAY)  TRTD205
C                                                                          TRTD206
      PCL2MX = 0.0                                                         TRTD207
      DO 96  KDT=1,NDT                                                     TRTD208
      IF (QQARR(KDT) .GT. 0.0)  GO TO 92                                   TRTD209
        BCIF   = 0.0                                                       TRTD210
      GO TO 94                                                             TRTD211
   92   BCIF   = 16050.0*BDARR(KDT)/(QQARR(KDT)*DT*60.0)                   TRTD212
   94   CL2DEM = BCIF/10.0                                                 TRTD213
      IF (CL2DEM .LT.  6.0)  CL2DEM =  6.0                                 TRTD214
      IF (CL2DEM .GT. 25.0)  CL2DEM = 25.0                                 TRTD215
        PCL2DM = CL2DEM*QDESYN*0.646*8.35                                  TRTD216
   96 IF (PCL2DM .GT. PCL2MX)  PCL2MX = PCL2DM                             TRTD217
C                                                                          TRTD218
C---------           READ TREATMENT PARAMETERS                             TRTD219
C                                                                          TRTD220
C---------           LEVEL 0 BRANCH (FOR ASSOCIATED STORAGE)               TRTD221
C                                                                          TRTD222
      IF (KPASS .EQ. 1)  GO TO 1000                                        TRTD223
      GO TO ( 600, 900), ISTOR                                             TRTD224
C                                                                          TRTD225
C                    01)  FOR NO ASSOCIATED STORAGE                        TRTD226
C                                                                          TRTD227
  800 WRITE(6,606)                                                         TRTD228
  606 FORMAT('0', 15X, 'NO STORAGE FROM A SEPARATE STORAGE MODEL',         TRTD229
     *       ' IS ASSOCIATED WITH THIS TREATMENT MODEL')                   TRTD230
      GO TO 1000                                                           TRTD231
C                                                                          TRTD232
C                    02)  FOR ASSOCIATED STORAGE                           TRTD233
C                                                                          TRTD234
  900 CALL STRCAT                                                          TRTD235
C                                                                          TRTD236
        QRAT = QDESYN/QQMAX                                                TRTD237
      IF (QRAT .LT. 1.20)  GO TO 1000                                      TRTD238
      WRITE(6,681)  QQMAX                                                  TRTD239
  681 FORMAT('0', 5X, 'DESIGN FLOW INPUT TO TREATMENT WIL BE '             TRTD240
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     *       'CONSIDERABLY RESTRICTED BY MAXIMUM POSSIBLE OUTFLOW',      TRTD241
     *       ' FROM STORAGE =', F10.2, ' CFS', /,                        TRTD242
     *       ' ', 20X, 'THEREFORE REDUCE TREATMENT DESIGN FLOW')         TRTD243
        QDESYN = QCMAX                                                   TRTD244
        KPASS  = 1                                                       TRTD245
       GO TO 55                                                          TRTD246
C                                                                        TRTD247
C---------          LEVEL 1 BRANCH (FOR TREATMENT BY BAR RACKS)          TRTD248
C                                                                        TRTD249
 1000   K = ITREAT(1) - 10                                               TRTD250
        L = 1                                                            TRTD251
       GO TO (1100,1200), K                                              TRTD252
C                                                                        TRTD253
C                   11)  FOR NO BAR RACKS                                TRTD254
C                                                                        TRTD255
 1100 WRITE(6,611)                                                       TRTD256
  611 FORMAT('0', 15X, 'BAR RACKS NOT INCLUDED  (LEVEL 1)')              TRTD257
       GO TO 2000                                                        TRTD258
C                                                                        TRTD259
C                   12)  FOR BAR RACKS                                   TRTD260
C                                                                        TRTD261
 1200   NSCRN  = QDESYN/240.0                                            TRTD262
       IF (NSCRN .LT. 2)  NSCRN = 2                                      TRTD263
        SCRCAP = QDESYN/NSCRN                                            TRTD264
        SUAREA = SCRCAP/3.0                                              TRTD265
        FAREAB = 1.4*SUAREA                                              TRTD266
       WRITE(6,612)  NSCRN,SCRCAP,SUAREA,FAREAB                          TRTD267
  612 FORMAT('0', 15X, 'PRELIMINARY TREATMENT BY MECHANICALLY CLEANED ',TRTD268
     *            'BAR RACKS  (LEVEL 1)',                               TRTD269
     * /,' ',20X, 'NUMBER OF SCREENS    =', I7, /, ' ',                 TRTD270
     *       20X, 'CAPACITY PER SCREEN =', F10.2, ' CFS', /, ' ',       TRTD271
     *       20X, 'SUBMERGED AREA      =', F10.2,                       TRTD272
     *            ' SQ.FT. (PERPENDICULAR TO THE FLOW)', /,            TRTD273
     *  ' ', 20X, 'FACE AREA OF BARS   =', F10.2, ' SQ.FT.')           TRTD274
C                                                                        TRTD275
C---------          LEVEL 2 BRANCH (FOR INLET PUMPING)                   TRTD276
C                                                                        TRTD277
 2000   K = ITREAT(2) - 20                                               TRTD278
        L = 2                                                            TRTD279
       GO TO (2100,2200), K                                              TRTD280
C                                                                        TRTD281
C                   21)  FOR GRAVITY INLET (NO PUMPING, = BYPASS)        TRTD282
C                                                                        TRTD283
 2100 WRITE(6,621)                                                       TRTD284
  621 FORMAT('0', 15X, 'INFLOW BY GRAVITY (NO PUMPING)  (LEVEL 2)')      TRTD285
       GO TO 3000                                                        TRTD286
C                                                                        TRTD287
C                   22)  FOR INLET PUMPING (STATION)                     TRTD288
C                                                                        TRTD289
 2200 READ(5,522)  HEAD1                                                 TRTD290
  522 FORMAT(F10.2)                                                      TRTD291
       WRITE(6,622)  HEAD1                                               TRTD292
  622 FORMAT('0', 15X, 'INFLOW BY INLET PUMPING (LEVEL 2)', /,           TRTD293
     *       ' ', 20X, 'PUMPED HEAD =', F7.2, ' FT. WATER')            TRTD294
C                                                                        TRTD295
C---------          LEVEL 3 BRANCH (FOR PRIMARY TREATMENT)               TRTD296
C                                                                        TRTD297
 3000   K = ITREAT(3) - 30                                               TRTD298
        L = 3                                                            TRTD299
       GO TO (3100,3200,3200,3400,3500), K                               TRTD300
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C                                                                       TRTD301
C                   31)  FOR NO PRIMARY TREATMENT (BYPASS)              TRTD302
C                                                                       TRTD303
 3100 WRITE(6,631)                                                      TRTD304
  631 FORMAT('0', 15X, 'NO PRIMARY TREATMENT INCLUDED  (LEVEL 3)')      TRTD305
      GO TO 4000                                                        TRTD306
C                                                                       TRTD307
C                   32) & 33)  FOR DISSOLVED AIR FLOATATION             TRTD308
C                                                                       TRTD309
 3200 READ (5,450)  ICHEM, ICL2, OVRDAF, RECIRC, DEEP                   TRTD310
  450 FORMAT (2I5, 3F10.2)                                              TRTD311
        TSURFA = (1.0+0.01*RECIRC)*QDESYN*1000000.0/(1.547*OVRDAF)      TRTD312
C??     DETMIN = TSURFA*DEEP/((1.0+0.01*RECIRC)*QDESYN*60.0)            TRTD313
C                   OVRDAF = DESIGN OVERFLOW RATE, GPD/SF (5000.00 SUGGETRTD314
C                   RECIRC = RECIRCULATION FLOW, PERCENT (15.00 SUGGESTETRTD315
C                   TSURFA = TOTAL SURFACE AREA, SQ.FT                  TRTD316
C                   DETMIN = DETENTION TIME, MIN                        TRTD317
      VOLDAF = TSURFA*DEEP                                              TRTD318
      WRITE (6,453)  MODSIZ,NOUNIT,QMOD(KMOD),QDESYN,OVRDAF,RECIRC,     TRTD319
     *                DEEP,TSURFA                                        TRTD320
  453 FORMAT( '0',15X,'TREATMENT BY DISSOLVED AIR FLOATATION  (LEVEL 3)'TRTD321
     .,/21X,'MODULE SIZE       =', I7, ' MGD'/21X,'NUMBER OF UNITS   =',TRTD322
     .I7/21X,'TOTAL DESIGN FLOW =',F7.2,' MGD, =', F7.2,' CFS', /,      TRTD323
     *        ' ', 20X, 'DESIGN OVERFLOW RATE =', F10.2,                TRTD324
     *                  ' GPD/SF,  (5000 SUGGESTED)', /,                TRTD325
     *        ' ', 20X, 'RECIRCULATION FLOW   =', F10.2,                TRTD326
     *                  ' PERCENT  (15 SUGGESTED)',  /,                 TRTD327
     *        ' ', 20X, 'TANK DEPTH           =', F10.2, ' FEET', /,    TRTD328
     *        ' ', 20X, 'TOTAL SURFACE AREA   =', F10.2, ' SQ.FT.')     TRTD329
      IF (ICHEM .GT. 0)  WRITE(6,455)                                   TRTD330
  455 FORMAT(' ', 20X, 'CHEMICALS WILL BE ADDED')                       TRTD331
      IF (ICHEM .EQ. 0)  WRITE(6,456)                                   TRTD332
  456 FORMAT(' ', 20X, 'NO CHEMICALS ADDED')                            TRTD333
      IF (ICL2 .GT. 0)  WRITE(6,457)                                    TRTD334
  457 FORMAT(' ', 20X, 'CHLORINE WILL BE ADDED')                        TRTD335
      IF (ICL2 .EQ. 0)  WRITE(6,458)                                    TRTD336
  458 FORMAT(' ', 20X, 'NO CHLORINE ADDED')                             TRTD337
      IF (ITREAT(3) .EQ. 33)  GO TO 3400                                TRTD338
      GO TO 4000                                                        TRTD339
C                                                                       TRTD340
C                   33) & 34)  FOR FINE SCREENS                         TRTD341
C                                                                       TRTD342
 3400   SCREEN=QDESYN*449./50.                                          TRTD343
C  SCREEN=AREA OF SCREENS ASSUMING DESIGN HYDRAULIC LOADING OF 50 GPM/SQTRTD344
      IF (ITREAT(3) .EQ. 33)  WRITE(6,461)                              TRTD345
  461 FORMAT('0',15X,'TREATMENT BY FINE SCREENS',                       TRTD346
     *       ' (AHEAD OF DISSOLVED AIR FLOATATION)  (LEVEL 3,')         TRTD347
      IF (ITREAT(3) .EQ. 34)  WRITE(6,462)                              TRTD348
  462 FORMAT('0',15X,'TREATMENT BY FINE SCREENS')                       TRTD349
      WRITE (6,460) SCREEN                                              TRTD350
  460 FORMAT (' ',20X,'TOTAL SCREEN AREA =', F10.0,' SQUARE FEET')      TRTD351
      GO TO 4000                                                        TRTD352
C                                                                       TRTD353
C                   35)  FOR SEDIMENTATION                              TRTD354
C                                                                       TRTD355
 3500 GO TO (3550,3600), ISTOR                                          TRTD356
C                   SED TANKS TO BE INSTALLED (NO ASSOCIATED STORAGE)   TRTD357
 3550 READ(5,535)  OVRSED, SEDEP, ICL2                                  TRTD358
  535 FORMAT(2F10.2, I10)                                               TRTD359
C                   NOTE:  SEDEP MAY VARY AS TANK FILLS                 TRTD360
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C                   ASSUME 10000 SQ. FT. PER UNIT (70 BY 140 FT)          TRTD361
C                   OVRSED = OVERFLOW RATE IN SED TANK, (GPD/SF)          TRTD362
C                   NO MODULES REQUIRED HERE                              TRTD363
       SEDNUM = QMCD(KMOD)*1000000.0/(OVRSED*10000.0)                     TRTD364
       NSED   = SEDNUM + 1.0                                              TRTD365
       SEDA   = 10000.0*SEDNUM/NSED                                       TRTD366
       VOLSED = SEDA*SEDEP*NSED                                           TRTD367
      WRITE(6,635)  OVRSED, SEDEP, NSED, SEDA                             TRTD368
  635 FORMAT('0', 15X, 'TREATMENT BY SEDIMENTATION (LEVEL 3)',            TRTD369
     *       ' - (NO ASSOCIATED STORAGE)', /,                             TRTD370
     *       ' ', 20X, 'DESIGN OVERFLOW RATE =', F10.2, ' GPD/SQ.FT.',    TRTD371
     *       '  (1600 SUGGESTED)', /,                                     TRTD372
     *       ' ', 20X, 'SED TANK DEPTH       =', F10.2, ' FEET',         TRTD373
     *       4X, '  (8 FEET SUGGESTED)', /,                               TRTD374
     *       ' ', 20X, 'NUMBER OF SED TANKS  =',   I10, /,                TRTD375
     *       ' ', 20X, 'SURFACE AREA         =', F10.2, ' SQ.FT./TANK')  TRTD376
      GO TO 3900                                                          TRTD377
C                   SEDIMENTATION IN ASSOCIATED STORAGE UNIT              TRTD378
C                   INPUT HANDLED IN LEVEL 0                              TRTD379
 3600 WRITE(6,636)                                                        TRTD380
  636 FORMAT('0', 15X, 'TREATMENT BY SEDIMENTATION IN ASSOCIATED',        TRTD381
     *       ' STORAGE - SEE LEVEL 0 ABOVE')                              TRTD382
 3900 IF (ICL2 .GT. 0)  WRITE(6,457)                                      TRTD383
      IF (ICL2 .EQ. 0)  WRITE(6,458)                                      TRTD384
C                                                                         TRTD385
C---------          LEVEL 4 BRANCH (FOR SECONDARY TREATMENT)              TRTD386
C                                                                         TRTD387
 4000   K = ITREAT(4) - 40                                                TRTD388
        L = 4                                                             TRTD389
      GO TO (4100,4200,4300), K                                           TRTD390
C                                                                         TRTD391
C                   41)  FOR NO SECONDARY TREATMENT (BYPASS)              TRTD392
C                                                                         TRTD393
 4100 WRITE(6,641)                                                        TRTD394
  641 FORMAT('0', 15X, 'NO SECONDARY TREATMENT INCLUDED  (LEVEL 4)')      TRTD395
      GO TO 5000                                                          TRTD396
C                                                                         TRTD397
C                   42)  FOR MICROSTRAINERS                               TRTD398
C                                                                         TRTD399
C                   DESIGN LOADING = 40 GPM/SQ.FT OF SUBMERGED AREA       TRTD400
 4200 IF (QMOD(KMOD) .GE. 25.0)  GO TO 4210                               TRTD401
C                   QDESYN .LT. 25 MGD                                    TRTD402
       NMS    = KMOD                                                     TRTD403
       CAPMS  = 5.0                                                       TRTD404
       AREAMS = QMOD(KMOD)*(1000000.0/1440.0)/(40.0*NMS)                  TRTD405
C                   NMS    = NO. OF MICROSTRAINER UNITS                   TRTD406
C                   CAPMS  = CAPACITY PER UNIT (MGD)                      TRTD407
C                   AREAMS = SUBMERGED SCREEN AREA (SQ.FT/UNIT)           TRTD408
      GO TO 4220                                                          TRTD409
C                   QDESYN .GE. 25 MGD                                    TRTD410
 4210   NMS    = (QDESYN + 0.1)/19.34                                     TRTD411
        CAPMS  = 12.5                                                     TRTD412
        AREAMS = 12.5*(1000000.0/1440.0)/40.0                             TRTD413
 4220 CONTINUE                                                            TRTD414
      WRITE(6,642)  NMS, CAPMS, AREAMS                                    TRTD415
  642 FORMAT('0', 15X, 'TREATMENT BY MICROSTRAINERS', /,                  TRTD416
     *       ' ', 20X, 'NUMBER OF UNITS      =', I10, /,                  TRTD417
     *       ' ', 20X, 'CAPACITY PER UNIT    =', F10.2, ' MGD', /,        TRTD418
     *       ' ', 20X, 'SUBMERGED SCREEN AREA=', F10.2,                   TRTD419
     *       ' SQ.FT. PER UNIT')                                          TRTD420
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      GO TO 5000                                                        TRTD421
C                                                                       TRTD422
C                     43)  FOR HIGH RATE FILTERS                        TRTD423
C                                                                       TRTD424
C                     ASSUME MIXED MEDIA, DOWNFLOW GRANULAR FILTERS.    TRTD425
C                     BASED ON EDISON, N.J. (DE FILLIPI)                TRTD426
C                                                                       TRTD427
 4300 READ(5,543)  OPRAMA, ICHEMH, HM, SQM                              TRTD428
  543 FORMAT(F10.2,I10,2F10.2)                                          TRTD429
CCC                   TEST FOR U/S EQUIP.  IF ONLY BAR-RACKS, WARN RE SPACTRTD430
       SREFFH = (0.80 + 0.15*ICHEMH)*100.0                              TRTD431
       BREFFH = (0.50 + 0.30*ICHEMH)*100.0                              TRTD432
       NUNITH = 4                                                       TRTD433
       QU     = QDESYN/NUNITH                                           TRTD434
      IF (QU .GT. 62.0)  NUNITH = QDESYN/62.0 + 1.0                     TRTD435
       NEVEN  = (NUNITH/2)*2                                            TRTD436
      IF (NUNITH .NE. NEVEN)  NUNITH = NUNITH + 1                       TRTD437
       QU     = QDESYN*449.0/NUNITH                                     TRTD438
       UAREAH = QU/OPRAMA                                               TRTD439
C                                                                       TRTD440
C                     NUNITH = NO. OF HIGH RATE FILTER UNITS            TRTD441
C                     UAREAH = FILTER AREA PER UNIT (SQ.FT.)            TRTD442
C                     OPRA   = OPERATING RATE (GPM/SQ.FT.)              TRTD443
C                     OPRAMA = MAX. OPERATING RATE (GPM/SQ.FT)          TRTD444
C                     ICHEMH = ADDITION-OF-CHEMICALS INDICATOR          TRTD445
C                            = 0 = NONE ADDED                           TRTD446
C                            = 1 = CHEMICALS ADDED                      TRTD447
C                     SREFFH = SOLIDS REMOVAL EFFICIENCY  (PERCENT)     TRTD448
C                     BREFFH = BOD    REMOVAL EFFICIENCY  (PERCENT)     TRTD449
C                     HM     = MAX. DESIGN HEAD LOSS (FT)               TRTD450
C                     SQM    = MAX. SOLIDS HOLDING CAPACITY, AT MAX. HEAD TRTD451
C                              AND MAX. FLOW RATE (LB/SQ.FT.)           TRTD452
C                                                                       TRTD453
      WRITE(6,643)  NUNITH,UAREAH,OPRAMA,SREFFH,BREFFH,HM,SQM           TRTD454
  643 FORMAT('0', 15X, 'TREATMENT BY HIGH RATE FILTERS (LEVEL 4)', /,   TRTD455
     *       ' ', 20X, 'NUMBER OF UNITS              =',   I10, /,      TRTD456
     *       ' ', 20X, 'FILTER AREA PER UNIT         =', F10.2, ' SQ.FT',/,TRTD457
     *       ' ', 20X, 'MAX. OPERATING RATE          =', F10.2,         TRTD458
     *                 ' GPM/SQ.FT.', /,                               TRTD459
     *       ' ', 20X, 'SOLIDS REMOVAL EFFICIENCY =',F10.2,' PERCENT',/,TRTD460
     *       ' ', 20X, 'BOD REMOVAL EFFICIENCY    =',F10.2,' PERCENT',/,TRTD461
     *       ' ', 20X, 'MAX. DESIGN HEAD LOSS     =', F10.2, ' FT.', /, TRTD462
     *       ' ', 20X, 'MAX. SOLIDS HOLDING CAP.  =', F10.2,         TRTD463
     *                 ' LB/SQ.FT. (AT MAX H AND Q)' )                 TRTD464
      IF (ICHEMH .EQ. 0)  WRITE(6,456)                                  TRTD465
      IF (ICHEMH .EQ. 1)  WRITE(6,455)                                  TRTD466
        SREFFH = SREFFH/100.0                                           TRTD467
        BREFFH = BREFFH/100.0                                           TRTD468
      GO TO 5000                                                        TRTD469
C                                                                       TRTD470
C---------          LEVEL 5 BRANCH (FOR EFFLUENT SCREENS)              TRTD471
C                                                                       TRTD472
 5000   K = ITREAT(5) - 50                                              TRTD473
        L = 5                                                           TRTD474
      GO TO (5100,5200), K                                              TRTD475
C                                                                       TRTD476
C                     51)  FOR NO EFFLUENT SCREENS                      TRTD477
C                                                                       TRTD478
 5100 WRITE(6,651)                                                      TRTD479
  651 FORMAT('0', 15X, 'NO EFFLUENT SCREENS  (LEVEL 5)')                TRTD480
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      GO TO 6000                                                        TRTD481
C                                                                       TRTD482
C                   52)  FOR EFFLUENT SCREENS                           TRTD483
C                                                                       TRTD484
C                   ASSUME WATERWORKS TRAVELLING BASKET TYPE SCREENS,   TRTD485
C                        6 MESH WIRE,                                   TRTD486
C                        450 GPM/SQ.FT GROSS SUBMERGED AREA RATING      TRTD487
C                   ASSUME MAX SUBMERGED AREA PER UNIT = 100 SQ.FT (SAY)TRTD488
C                                                                       TRTD489
 5200   UNESN  = QDESYN/100.0                                          TRTD490
        NOESUN = INT(UNESN)                                             TRTD491
        UNESNO = FLOAT(NOESUN)                                          TRTD492
      IF (UNESNO .GE. UNESN)  GO TO 5210                                TRTD493
        UNESNO = UNESNO + 1.0                                           TRTD494
        NOESUN = NOESUN + 1                                             TRTD495
 5210 IF (NOESUN .GT. 1)  GO TO 5220                                    TRTD496
        UNESNO = 2.0                                                    TRTD497
        NOESUN = 2                                                      TRTD498
 5220   QQESUN = QDESYN*0.646/UNESNO                                    TRTD499
      WRITE(6,652)  QQESUN,NOESUN                                       TRTD500
  652 FORMAT('0', 15X, 'TREATMENT BY EFFLUENT SCREENS (LEVEL 5)',       TRTD501
     *                 ' (FOR AESTHETIC IMPROVEMENTS)', /,              TRTD502
     *       ' ', 20X, 'MODULE SIZE =', F10.2,                          TRTD503
     *       ' MGD, (MAX = 64.6 MGD.)', /,                              TRTD504
     *       ' ', 20X, 'NO. UNITS   =', I7)                             TRTD505
C                                                                       TRTD506
C---------          LEVEL 6 BRANCH (FOR OUTLET PUMPING)                 TRTD507
C                                                                       TRTD508
 6000   K = ITREAT(6) - 60                                              TRTD509
        L = 6                                                           TRTD510
      GO TO (6100,6200), K                                              TRTD511
C                                                                       TRTD512
C                   61)  FOR GRAVITY OUTLET (NO PUMPING, = BYPASS)      TRTD513
C                                                                       TRTD514
 6100 WRITE(6,661)                                                      TRTD515
  661 FORMAT('0', 15X, 'OUTFLOW BY GRAVITY (NO PUMPING)  (LEVEL 6)')    TRTD516
      GO TO 7000                                                        TRTD517
C                                                                       TRTD518
C                   62)  FOR OUTLET PUMPING (STATION)                   TRTD519
C                                                                       TRTD520
 6200 READ(5,522)  HEAD2                                                TRTD521
      WRITE(6,662)  HEAD2                                               TRTD522
  662 FORMAT('0', 15X, 'OUTFLOW BY OUTLET PUMPING (LEVEL 6)', /,        TRTD523
     *       ' ', 20X, 'PUMPED HEAD =', F7.2, ' FT. WATER')             TRTD524
C                                                                       TRTD525
C---------          LEVEL 7 BRANCH (FOR CHLORINE CONTACT TIME)          TRTD526
C                                                                       TRTD527
 7000   K = ITREAT(7) - 70                                              TRTD528
        L = 7                                                           TRTD529
      GO TO (7100,7200), K                                              TRTD530
C                                                                       TRTD531
C                   71)  FOR NO CONTACT TANK (BYPASS)                   TRTD532
C                                                                       TRTD533
 7100 WRITE(6,671)                                                      TRTD534
  671 FORMAT('0',15X, 'NO CHLORINE CONTACT TANK FOR OUTFLOW  (LEVEL 7)')TRTD535
      GO TO 8000                                                        TRTD536
C                                                                       TRTD537
C                   72)  FOR CHLORINE CONTACT TANK                      TRTD538
C                                                                       TRTD539
 7200   CAPUCL = 2000.0                                                 TRTD540
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      IF (PCL2MX .GT. 8000.0)  CAPUCL = 8000.0                          TRTD541
        NUNITC = PCL2MX/CAPUCL + 1.0                                    TRTD542
        VOLCON = QDESYN*60.0*15.0                                       TRTD543
      WRITE(6,672)  NUNITC,CAPUCL,PCL2MX,VOLCON                         TRTD544
  672 FORMAT('0', 15X, 'TREATMENT BY CHLORINE CONTACT TANK (LEVEL 7)',/,TRTD545
     *       ' ', 20X, 'NUMBER OF DOSING UNITS =', I10,    /,           TRTD546
     *       ' ', 20X, 'DOSING RATE PER UNIT   =', F10.2, ' LB/DAY', /, TRTD547
     *       ' ', 20X, 'MAXIMUM DEMAND RATE    =', F10.2, ' LB/DAY', /, TRTD548
     *       ' ', 20X, 'VOLUME OF CONTACT TANK =', F10.0,               TRTD549
     *                 ' CU.FT, AT 15 MIN. DETENTION TIME')             TRTD550
C                                                                       TRTD551
C----------------- READ INITIAL CONDITIONS-----------------------------TRTD552
C                                                                       TRTD553
 8000 READ (5,570) KHCUR,KMIN                                           TRTD554
  570 FORMAT (2I5)                                                      TRTD555
C&&&                                                                    TRTD556
      GO TO 9999                                                        TRTD557
C                                                                       TRTD558
C----------------- ERROR MESSAGES -------------------------------------TRTD559
C                                                                       TRTD560
 9000 WRITE(6,690)  L, ITREAT(L)                                        TRTD561
  690 FORMAT('0*** ITREAT(', I1, ') = ', I2,                            TRTD562
     *       ' IS OF A TYPE NOT PRESENTLY MODELED.  EXECUTION STOPPED') TRTD563
      STOP                                                              TRTD564
C                                                                       TRTD565
  901 IF (KFLAG .EQ. 10)  GO TO 902                                     TRTD566
      WRITE(6,691)                                                      TRTD567
  691 FORMAT('0 *** TERMINATE - INPUT TO INTERP PROCEDURE IS LESS THAN LTRTD568
     *OWEST VALUE ON CURVE (IN SUBRT. TRTDAT)')                         TRTD569
      STOP                                                              TRTD570
C                                                                       TRTD571
  902 WRITE(6,692)                                                      TRTD572
  692 FORMAT('0 *** TERMINATE - INPUT TO INTERP PROCEDURE IS GREATER THATRTD573
     *N LARGEST VALUE ON CURVE (IN SUBRT. TRTDAT)')                     TRTD574
      STOP                                                              TRTD575
  903 WRITE(6,693)  QDSMGD, QMOD(19)                                    TRTD576
  693 FORMAT('0***', 5X, 'QDESYN =', F10.2, ' MGD IS LARGER THAN MAXIMUMTRTD577
     * AVAILABLE COMBINATION OF MODULE SIZES =', F10.2, ' MGD.', /,     TRTD578
     * '0', 8X, 'MODEL IS INADEQUATE, SO TERMINATE EXECUTION.')         TRTD579
      STOP 693                                                          TRTD580
C                                                                       TRTD581
C                                                                       TRTD582
 9999 RETURN                                                            TRTD583
      END                                                               TRTD584
C=======================================================================TRTD585
```

```
      SUBROUTINE TRCHEK                                                  TRCH  1
      COMMON  CONVER,KHOUR,KMIN,L,KMOD,NFLAG,BIG,HEAD1,HEAD2,            TRCH  2
     *  QDESYN,CQIF,WAOU(7),WAIN(7),QQOU(7),QQIN(7),WARM(7),QQRL,        TRCH  3
     *  BDIF,QQRM(7),BDOU(7),BDIN(7),BCOU(7),BCIN(7),BDRL,               TRCH  4
     *  SSIF,SSIN(7),SSOU(7),SCOU(7),SCIN(7),SSRM(7),SSRL,COIF,CORL,     TRCH  5
     *  ADEPTH(11),AASURF(11),ITREAT(7),ISTOR,IPRINT,ICOST,HREF,         TRCH  6
     *  MODSIZ,ICHEM,ICL2,SCREEN,QQIFMX,DESF,IRANGE,KNTOF,TRIBA,SEDA,    TRCH  7
     *  SQM,SREFFH,BREFFH,NUNITH,UAREAH,UPRAMA,ICHEMH,HM,VOLDAF,ITABLE,  TRCH  8
     *  MODCST,TOTCST,RECIRC,OVRDAF,TSURFA,OVRSED,NSED,JM(7),WTRMT5,     TRCH  9
     *  NSCRN,SCRCAP,SUAREA,FAREAB,NMS,AREAMS,VOLCON,VOLSED,ALJMUT,      TRCH 10
     *  BDINT(7),SSINT(7),WAINT(7),BDOUT(7),SSOUT(7),WAOUT(7),           TRCH 11
     *  WARMT(7),BDRMT(7),SSRMT(7),CHEMUT(8),CL2UT(8),QMOD(20),WTRMT1,   TRCH 12
     *  QQRMT(7),QQOUT(7),QCRMMX(7),QQOUMX(7),QQRMMN(7),QQOUMN(7),       TRCH 13
     *  BCRMT(7),BCOUT(7),BCRMMX(7),BCOUMX(7),BCRMMN(7),BCOUMN(7),       TRCH 14
     *  SCRMT(7),SCOUT(7),SCRMMX(7),SCOUMX(7),SCRMMN(7),SCOUMN(7),       TRCH 15
     *  BDRM(7),BCRM(7),SCRM(7)                                          TRCH 16
      DIMENSION  NOCOMB(15), NOECON(10)                                  TRCH 17
C                                                                        TRCH 18
C                    NNCOMB = NO. OF ILLEGAL COMBINATIONS                TRCH 19
C                    NOCOMB = AN ILLEGAL COMBINATION PAIR                TRCH 20
C                                                                        TRCH 21
        NFLAG  = 1                                                       TRCH 22
        KNCOMB = 0                                                       TRCH 23
        NNCOMB = 11                                                      TRCH 24
        NOCOMB(1)  = 2211                                                TRCH 25
        NOCOMB(2)  = 3111                                                TRCH 26
        NOCOMB(3)  = 3211                                                TRCH 27
        NOCOMB(4)  = 3311                                                TRCH 28
        NOCOMB(5)  = 3411                                                TRCH 29
        NOCOMB(6)  = 4211                                                TRCH 30
        NOCOMB(7)  = 4311                                                TRCH 31
        NOCOMB(8)  = 7211                                                TRCH 32
        NOCOMB(9)  = 5233                                                TRCH 33
        NOCOMB(10) = 5234                                                TRCH 34
        NOCOMB(11) = 5243                                                TRCH 35
C                                                                        TRCH 36
 1000 DO 4200  I=1,NNCOMB                                                TRCH 37
 2000 DO 4100  K=1,7                                                     TRCH 38
        ITR100 = ITREAT(K)*100                                           TRCH 39
        ITR    = NOCOMB(I) - ITR100                                      TRCH 40
 3000 DO 4000  KK=1,7                                                    TRCH 41
      IF (ITREAT(KK) .NE. ITR)  GO TO 4000                               TRCH 42
        KNCOMB = KNCOMB + 1                                              TRCH 43
      IF (KNCOMB .EQ. 1)  WRITE(6,630)                                   TRCH 44
  630 FORMAT('0 THE FOLLOWING COMBINATIONS OF TREATMENT OPTIONS HAVE ',   TRCH 45
     *       'BEEN SPECIFIED AS INADMISSABLE',                           TRCH 46
     *       ' * SIMULATION WILL THEREFORE BE DISCONTINUED', /,          TRCH 47
     *       '0       ITREAT    WITH    ITREAT',  /)                     TRCH 48
      WRITE(6,631)  ITREAT(K), ITR                                       TRCH 49
  631 FORMAT(' ', 9X, I2, 6X, 'WITH', 6X, I2)                            TRCH 50
 4000 CONTINUE                                                           TRCH 51
 4100 CONTINUE                                                           TRCH 52
 4200 CONTINUE                                                           TRCH 53
C                                                                        TRCH 54
      IF (KNCOMB .EQ. 0)  GO TO 5000                                     TRCH 55
        NFLAG = 0                                                        TRCH 56
C                                                                        TRCH 57
 5000 IF (ISTOR .EQ. 2 .AND. ITREAT(3) .NE. 35)  GO TO 25                TRCH 58
      GO TO 6000                                                         TRCH 59
   25 WRITE(6,610)                                                       TRCH 60
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  610 FORMAT('0ISTOR = 02 IN THE INPUT DATA REQUIRES THAT ITREAT(3) ',  TRCH 61
     *       '8E SET TO 35 * NOT SO, SO SIMULATION IS DISCONTINUED')    TRCH 62
        NFLAG = 0                                                       TRCH 63
C                                                                       TRCH 64
C                    NNECON = NO. OF UNECONOMIC COMBINATIONS            TRCH 65
C                    NOECON = AN UNECONOMIC COMBINATION PAIR            TRCH 66
C                                                                       TRCH 67
 6000   KNECON = 0                                                      TRCH 68
        NNECON = 8                                                      TRCH 69
        NOECON(1) = 4233                                                TRCH 70
        NOECON(2) = 4234                                                TRCH 71
        NOECON(3) = 5232                                                TRCH 72
        NOECON(4) = 5235                                                TRCH 73
        NOECON(5) = 5242                                                TRCH 74
        NOECON(6) = 7232                                                TRCH 75
        NOECON(7) = 7233                                                TRCH 76
        NOECON(8) = 7235                                                TRCH 77
      DO 8200  I=1,NNECON                                               TRCH 78
      DO 8100  K=1,7                                                    TRCH 79
        ITR100 = ITREAT(K)*100                                          TRCH 80
        ITR    = NOECON(I) - ITR100                                     TRCH 81
      DO 8000  KK=1,7                                                   TRCH 82
      IF (ITREAT(KK) .NE. ITR)  GO TO 8000                              TRCH 83
        KNECON = KNECON + 1                                             TRCH 84
      IF (KNECON .EQ. 1)  WRITE(6,640)                                  TRCH 85
  640 FORMAT('0**** WARNING ****', /,                                   TRCH 86
     *       '0        THE FOLLOWING COMBINATIONS OF TREATMENT ',      TRCH 87
     *       'OPTIONS ARE CONSIDERED ECONOMICALLY INADVISEABLE',       TRCH 88
     *       ' - SIMULATION CONTINUES', /,                             TRCH 89
     *       '0       ITREAT    WITH    ITREAT',  /)                   TRCH 90
      WRITE(6,631)  ITREAT(K), ITR                                      TRCH 91
 8000 CONTINUE                                                          TRCH 92
 8100 CONTINUE                                                          TRCH 93
 8200 CONTINUE                                                          TRCH 94
C                                                                       TRCH 95
      IF (ITREAT(4) .NE. 43)  GO TO 9999                                TRCH 96
C                                                                       TRCH 97
C                    CHECK FOR DT-SIZE WITH HIGH RATE FILTERS           TRCH 98
        E = 0.0001                                                      TRCH 99
      IF (ABS(DT-0.5) .LT. E)  GO TO 8500                               TRCH100
      IF (ABS(DT-1.0) .LT. E)  GO TO 8500                               TRCH101
      IF (ABS(DT-2.0) .LT. E)  GO TO 8500                               TRCH102
      IF (ABS(DT-2.5) .LT. E)  GO TO 8500                               TRCH103
      IF (ABS(DT-5.0) .LT. E)  GO TO 8500                               TRCH104
      IF (ABS(DT-10.) .LT. E)  GO TO 8500                               TRCH105
      WRITE(6,650)  DT                                                  TRCH106
  650 FORMAT('0', 5X, 'DT =', F10.2, ' MIN. IS AN UNACCEPTABLE',        TRCH107
     *       ' VALUE WITH HIGH RATE FILTERS', /,                       TRCH108
     *       ' ', 10X, '(REQUIRED TO BE EITHER 0.5, 1.0, 2.0,',        TRCH109
     *       ' 2.5, 5.0, OR 10.0 MIN.)' )                              TRCH110
        NFLAG = 0                                                       TRCH111
 8500   HRFD  = 10.0/DT                                                 TRCH112
C                    ADD CHECK FOR CL2 ADDED AT ONE LOCATION ONLY       TRCH113
C                                                                       TRCH114
 9999 RETURN                                                            TRCH115
      END                                                               TRCH116
C-----------------------------------------------------------------------TRCH117
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      SUBROUTINE STRDAT                                                 STRD  1
      COMMON  CONVER,KHOUR,KMIN,L,KMOD,NFLAG,BIG,HEAD1,HEAD2,           STRD  2
     *  QDESYN,CCIF,WACU(7),WAIN(7),QQOU(7),QQIN(7),WARM(7),QQRL,       STRD  3
     *  BDIF,QCRM(7),BDCU(7),BDIN(7),BCOU(7),BCIN(7),BDRL,              STRD  4
     *  SSIF,SSIN(7),SSOU(7),SCOU(7),SCIN(7),SSRM(7),SSRL,COIF,CORL,    STRD  5
     *  ADEPTH(11),AASURF(11),ITREAT(7),ISTOR,IPRINT,ICOST,HPFD,        STRD  6
     *  MODSIZ,ICHEM,ICL2,SCREEN,QQIFMX,DESF,IRANGE,KNTOF,TRIBA,SEDA,   STRD  7
     *  SQM,SREFFH,BREFFH,NUNITH,UAREAH,OPRAMA,ICHEMH,HM,VOLDAF,ITABLE, STRD  8
     *  MODCST,TOTCST,RECIRC,UVRDAF,TSURFA,UVRSED,NSED,JM(7),WTRMT5,    STRD  9
     *  NSCRN,SCRCAP,SUAREA,FAREAB,NMS,AREAMS,VOLCON,VOLSED,ALUMUT,     STRD 10
     *  BDINT(7),SSINT(7),WAINT(7),BDOUT(7),SSOUT(7),WAOUT(7),          STRD 11
     *  WARMT(7),BCRMT(7),SSRMT(7),CHEMUT(8),CL2UT(8),QMOD(20),WTRMT1,  STRD 12
     *  QQRMT(7),QQOUT(7),QQRMMX(7),QQOUMX(7),QQRMMN(7),QQOUMN(7),      STRD 13
     *  BCRMT(7),BCOUT(7),BCRMMX(7),BCOUMX(7),BCRMMN(7),BCOUMN(7),      STRD 14
     *  SCRMT(7),SCOUT(7),SCRMMX(7),SCOUMX(7),SCRMMN(7),SCOUMN(7),      STRD 15
     *  BDRM(7),BCRM(7),SCRM(7)                                         STRD 16
      COMMON  /STBK/QIN(150),BODIN(150),SUSIN(150),COLIN(150),          STRD 17
     *  QINST,CCUST,CINSTL,QOUSTL,STORL,QOUTO,STORO,                    STRD 18
     *  ISPRIN,IPOL,DEPMAX,COMAX,DEPTH,                                 STRD 19
     *  ATERM(11),AO2DT2(11),BDEPTH(11),BSTOR(11),                      STRD 20
     *  DUMSTR(11),DUMDEP(11),                                          STRD 21
     *  VOLIN(150),VOLOUT(150),STOR,CUMIN,CUMOUT,                       STRD 22
     *  SBOD,SSS,SCCL,BODOUT,SUSOUT,COLOUT,                             STRD 23
     *  ISTMOD,ISTTYP,ISTOUT,                                           STRD 24
     *  QPUMP,CSTART,CSTOP,                                             STRD 25
     *  DTON,STORMX,DTPUMP,DTMORE,STORF,APLAN,                          STRD 26
     *  CLANC,CSTOR,CPS,CTOTAL,CPCUYD,CPACRE,                           STRD 27
     *  LP,JP,LPREV,LABEL,DETENT(150),FRAC(150)                         STRD 28
      COMMON  /TBLK/DT,NDT,KDT                                          STRD 29
      DIMENSION  NUE(3)                                                 STRD 30
      DT=DT*60.0                                                        STRD 31
C                                                                       STRD 32
      READ(5,501)  ISTMOD, ISTTYP, ISTOUT                               STRD 33
  501 FORMAT(10I5)                                                      STRD 34
C                                                                       STRD 35
C                    NOTE..   OPERATIONAL OPTIONS INDICATED BY '*'      STRD 36
C                                                                       STRD 37
C                    ISTMOD = STORAGE MODE (ROUTING, HOLDING, ETC)      STRD 38
C                 *          = 1 = IN-LINE                            STRD 39
C                            = 2 = OFF-LINE                           STRD 40
C                            = 3 = INTRASYSTEM                        STRD 41
C                            = 4 = REROUTING                          STRD 42
C                    ISTTYP = STORAGE STRUCTURE (NATURAL, TANK, BAG)  STRD 43
C                 *          = 1 = IRREGULAR (NATURAL) RESERVOIR      STRD 44
C                 *          = 2 = GEOMETRIC (REGULAR) RESERVOIR - COVEREDSTRD 45
C                 *          = 3 = GEOMETRIC (REGULAR) RESERVOIR - UNCOVERSTRD 46
C                            = 4 = INTRASYSTEM                        STRD 47
C                            = 5 = RUBBER BAG                         STRD 48
C-EXCLUDED           ISTEXS = EXCESS FLOW HANDLING (BYPASS, BACK-UP, FLOOSTRD 49
C-EXCLUDED                    = 1 = BYPASS FRACTION CONTINUOUSLY, UNDER GRASTRD 50
C-EXCLUDED                    = 2 = BYPASS FRACTION CONTINUOUSLY, CONTROLLESTRD 51
C-EXCLUDED                    = 3 = BYPASS ALL, AFTER SURCHARGE BEGINS (CONSTRD 52
C-EXCLUDED                    = 4 = BACK UP                            STRD 53
C-EXCLUDED                    = 5 = PASS THROUGH (UNDER HEAD)          STRD 54
C-EXCLUDED        *           = 6 = FLOODS (AND SIMULATION TERMINATES) STRD 55
C                    ISTOUT = OUTLET TYPE (GRAVITY, PUMP)             STRD 56
C                 *          = 1 = GRAVITY WITH FIXED ORIFICE         STRD 57
C                 *          = 2 = GRAVITY WITH FIXED WEIR            STRD 58
C                            = 3 = GRAVITY WITH FIXED SIDE-WEIR       STRD 59
C                            = 4 = GRAVITY WITH FIXED SIPHON          STRD 60
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C                                = 5 = NEW PUMPS
C                 *              = 6 = EXISTING PUMPS
C                                = 7 = ADJUSTABLE VALVE WITH GRAVITY
C                                = 8 = SLUICE GATE WITH GRAVITY
C-EXCLUDED              ISTBUP = BACK-UP EFFECTS (YES/NO)
C-EXCLUDED                       = 1 = NO
C-EXCLUDED                       = 2 = YES, UPSTREAM OF INLET POINT
C-EXCLUDED                       = 3 = YES, UPSTREAM OF OUTLET POINT
C
      WRITE(6,602)  ISTOUT, ISTMOD, ISTTYP
  602 FORMAT(' ', 20X, 'CHARACTERISTICS OF STORAGE UNIT ARE',
     *       /,  ' ', 25X, 'OUTLET TYPE  =',  I3,
     *       /,  ' ', 25X, 'STORAGE MODE =', I3,
     *       /,  ' ', 25X, 'STORAGE TYPE =',  I3)
C
C                       IPOL   = 1 = SOLIDS PRESENT (100% EFFICIENT PLUG FLO
C                              = 2 = SOLIDS PRESENT (100% EFFICIENT MIXING)
C                       IPRINT = 0 = NO PRINTOUT EACH TIME-STEP (SUMMARY POS
C                              = 1 = PRINTOUT ALL TIME-STEP SOLUTIONS (EACH
C                       ICOST  = 0 = NO COST SUMMARY
C                       ICOST  = 1 = COST SUMMARY INCLUDED
C
      READ(5,502)  IPOL, ISPRIN
  502 FORMAT(2I10)
      WRITE(6,603)  IPOL, ISPRIN
  603 FORMAT('C', 20X, 'IPOL =', I2, ', PRINT CONTROL (ISPRIN) =', I2)
C
C---------              READ RESERVOIR PARAMETERS
C
C
C                       BRANCH TO STORAGE TYPE (ISTTYP)
C
 1000 IF (ISTTYP .EQ. 1)  GO TO 1100
      IF (ISTTYP .EQ. 2)  GO TO 1200
      IF (ISTTYP .EQ. 3)  GO TO 1200
CC    IF (ISTTYP .EQ. 4)  GO TO
CC    IF (ISTTYP .EQ. 5)  GO TO
      GO TO 904
C
C                       A)  FOR IRREGULAR (NATURAL) RESERVOIR
C
 1100 READ(5,511)  DEPMAX, ICL2
  511 FORMAT(F10.2, I10)
C                       DEPMAX = MAX. ALLOWABLE DEPTH IN RESERVOIR (FT.)
      WRITE(6,611)  DEPMAX
  611 FORMAT('C', 20X, 'NATURAL RESERVOIR, WITH MAX. DEPTH =', F7.2,
     *' FT.',10X,  ' 11 DEPTH/AREA PARAMETERS ARE', /,
     *       ' ', 25X, 4('DEPTH(FT) AREA(SQ.FT)', 4X))
      READ(5,512)  (ADEPTH(I), AASURF(I),  I=1,11)
  512 FORMAT(4(F10.2, F10.0))
C                       ADEPTH = DATA DEPTH (FT), 0 - DEPMAX.
C                       AASURF = DATA SURF. AREA OF NAT. RESERVOIR (SQ. FT.)
      WRITE(6,612)  (ADEPTH(I), AASURF(I),  I=1,11)
  612 FORMAT(    ' ', 23X, F10.2, F10.0, 5X, F10.2, F10.0, 5X,
     *                    F10.2, F10.0, 5X, F10.2, F10.0)
      IF (ADEPTH(11) .LT. DEPMAX)  GO TO 903
C
      CALL INTERP(ADEPTH,AASURF,11,DEPMAX,APLAN,KFLAG)
C
      IF (KFLAG .NE. 0)  GO TO 901
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        APLAN = APLAN*1.25                                                  STRD121
      GO TO 2000                                                            STRD122
C                                                                           STRD123
C                     B)  FOR REGULAR (MAN-MADE) RESERVOIR                  STRD124
C                                                                           STRD125
 1200 READ(5,511)  DEPMAX, ICL2                                             STRD126
      READ(5,513)  BASEA, BASEC, COTSLO                                     STRD127
  513 FORMAT(2F10.0, F10.5)                                                 STRD128
C                     BASEA   = BASE AREA OF RESERVOIR (SQ.FT.)             STRD129
C                     BASEC   = BASE CIRCUMF. OF RESERVOIR (FT.)            STRD130
C                     COTSLO = COTAN OF SIDESLOPE ANGLE (HORIZ/VERT)        STRD131
      ADEPTH(1)=0.0                                                         STRD132
      AASURF(1)=BASEA                                                       STRD133
      DO 1  MMM=2,11                                                        STRD134
      ADEPTH(MMM)=ADEPTH(MMM-1)+DEPMAX/10.0                                 STRD135
      AASURF(MMM)=BASEA                                                     STRD136
    1 CONTINUE                                                              STRD137
        APLAN = (BASEA + BASEC*COTSLO*DEPMAX)*1.25                          STRD138
      WRITE(6,613)  DEPMAX, BASEA, BASEC, COTSLO                            STRD139
  613 FORMAT('0', 15X, 'MAN-MADE RESERVOIR, WITH MAX. DEPTH =', F7.2,       STRD140
     *   ' FT.,  AND CHARACTERISTICS',   /, ' ', 25X,                       STRD141
     *       'BASE AREA =', F10.0, ' SQ.FT.,', 7X,                          STRD142
     *       'BASE CIRCUMF. =', F10.0, ' FT.,', 6X,                         STRD143
     *       'COT(SIDESLOPE) =', F10.5)                                     STRD144
C                                                                           STRD145
C---------          READ OUTLET CONTROL DATA                                STRD146
C                                                                           STRD147
C                     BRANCH TO OUTLET TYPE (ISTOUT)                        STRD148
C                                                                           STRD149
 2000 IF (ISTOUT .EQ. 1)  GO TO 2100                                        STRD150
      IF (ISTOUT .EQ. 2)  GO TO 2200                                        STRD151
CC    IF (ISTOUT .EQ. 3)  GO TO                                             STRD152
CC    IF (ISTOUT .EQ. 4)  GO TO                                             STRD153
CC    IF (ISTOUT .EQ. 5)  GO TO                                             STRD154
      IF (ISTOUT .EQ. 6)  GO TO 2600                                        STRD155
CC    IF (ISTOUT .EQ. 7)  GO TO                                             STRD156
CC    IF (ISTOUT .EQ. 8)  GO TO                                             STRD157
      GO TO 906                                                             STRD158
C                                                                           STRD159
C                     A)  OUTLET BY GRAVITY WITH FIXED ORIFICE              STRD160
C                                                                           STRD161
 2100 READ(5,521)  CDAOUT                                                   STRD162
  521 FORMAT(F10.3)                                                         STRD163
C                     CDAOUT = OUTLET ORIFICE AREA * DISCHARGE COEFFICIENT  STRD164
      WRITE(6,621)  CDAOUT, DT                                              STRD165
  621 FORMAT(' ', 20X, 'RESERVOIR OUTLET CONTROL BY GRAVITY WITH FIXED OS   STRD166
     *RIFICE', /, ' ', 20X, 'ORIFICE AREA*CD =', F10.3, ' SQ.FT,  DT =',    STRD167
     *F10.2, ' SEC. (FROM INPUT HYDROGRAPH)', /, ' ', 20X, 'NOTE..', /,     STRD168
     *' ', 23X, 'ORIFICE CENTERLINE ASSUMED AT TANK DEPTH = 0, WHEN STOR    STRD169
     *AGE = 0')                                                             STRD170
        QOMAX = CDAOUT*SQRT(64.4*DEPMAX)                                    STRD171
C                                                                           STRD172
      GO TO 3000                                                            STRD173
C                                                                           STRD174
C                     B)  OUTLET BY GRAVITY WITH FIXED WEIR                 STRD175
C                                                                           STRD176
 2200 READ(5,522)  WEIRHT, WEIRL                                            STRD177
  522 FORMAT(2F10.3)                                                        STRD178
C                     WEIRHT = RES. DEPTH (FT) WHEN SURF. AT WEIR ELEV.     STRD179
C                     WEIRL  = WEIR LENGTH (FT)                             STRD180
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C                     WEIRQ  = 3.33*(DEPTH-WEIRHT)**1.5  (CFS/FT)          STRD181
      WRITE(6,622)  WEIRHT, WEIRL, DT                                      STRD182
  622 FORMAT(' ', 20X, 'RESERVOIR OUTLET CONTROL BY GRAVITY WITH FIXED WSTRD183
     *EIR', /, ' ', 20X, 'WEIR HEIGHT =', F6.2, ' FT, WEIR LENGTH =',     STRD184
     * F7.2, ' FT,  DT =', F10.2, ' SEC. (FROM INPUT HYDROGRAPH)')        STRD185
        QOMAX = WEIRL*3.33*(DEPMAX-WEIRHT)**1.5                            STRD186
C                                                                          STRD187
      GO TO 3000                                                           STRD188
C                                                                          STRD189
C                     F) OUTLET BY EXISTING PUMPS                          STRD190
C                                                                          STRD191
 2600 READ(5,526)  QPUMP,DSTART,DSTOP                                      STRD192
  526 FORMAT(3F10.3)                                                       STRD193
C                     QPUMP  = CONSTANT PUMPED OUTFLOW RATE (CFS)          STRD194
C                     DSTART = RESERVOIR DEPTH AT START OF PUMPING (FT)    STRD195
C                     DSTOP  = RESERVOIR DEPTH AT END   OF PUMPING (FT)    STRD196
      WRITE(6,626)  QPUMP,DSTART,DSTOP                                     STRD197
  626 FORMAT(' ', 20X, 'RESERVOIR OUTFLOW BY FIXED-RATE PUMPING', /,       STRD198
     *       ' ', 20X, 'PUMPING RATE =', F7.2, ' CFS, PUMPING START',     STRD199
     *       ' DEPTH =', F6.2, ' FT, PUMPING STOP DEPTH =', F6.2, ' FT')STRD200
        QOMAX = QPUMP                                                      STRD201
      IF (DSTART .GT. DSTOP)  GO TO 3000                                   STRD202
C                                                                          STRD203
        DSTOP = DSTART - 0.5                                               STRD204
      WRITE(6,627)                                                         STRD205
  627 FORMAT('0****** WARNING. STOP DEPTH SHOULD BE LESS THAN START',      STRD206
     *       ' DEPTH', /, ' ', 10X, 'RESET STOP DEPTH TO', F6.2, ' FT')  STRD207
      GO TO 3000                                                           STRD208
C                                                                          STRD209
C                     END OF INPUT PARAMETERS FOR STORAGE UNITS            STRD210
C                                                                          STRD211
C                                                                          STRD212
C------------------ COMPUTE DEPTH/STORAGE RELATION (ARRAY) -------------STRD213
C                                                                          STRD214
C                     NOTE                                                 STRD215
C                      RUBBER BAG AND INTRASYSTEM DO NOT HAVE 'DEPTH'       STRD216
C                                                                          STRD217
C                     BRANCH TO STORAGE TYPE (ISTTYP)                      STRD218
C                                                                          STRD219
 3000 IF (ISTTYP .EQ. 1)  GO TO 3100                                       STRD220
      IF (ISTTYP .EQ. 2)  GO TO 3200                                       STRD221
      IF (ISTTYP .EQ. 3)  GO TO 3200                                       STRD222
CC    IF (ISTTYP .EQ. 4)  GO TO                                            STRD223
CC    IF (ISTTYP .EQ. 5)  GO TO                                            STRD224
      GO TO 904                                                            STRD225
C                                                                          STRD226
C---------            A)  FOR 'NATURAL' RESERVOIR                         STRD227
C                                                                          STRD228
 3100   DDEPTH = DEPMAX/10.0                                               STRD229
      IF (ISTOUT .EQ. 2 .OR. ISTOUT .EQ. 3)                                STRD230
     *  DDEPTH = WEIRHT/3.0                                               STRD231
        DUMDEP(1) = 0.0                                                    STRD232
        DEPTH  = 0.0                                                       STRD233
C                                                                          STRD234
      CALL INTERP(ADEPTH, AASURF, 11, DEPTH, AREA, KFLAG)                  STRD235
C                                                                          STRD236
      IF (KFLAG .NE. 0)  GO TO 901                                         STRD237
        AREA2  = AREA                                                      STRD238
        DUMSTR(1) = 0.0                                                    STRD239
      DO 3150  I=2,11                                                      STRD240
```

```
        AREA1  = AREA2                                                    STRD241
      IF ((ISTCUT .EQ. 2 .OR. ISTOUT .EQ. 3) .AND.                       STRD242
     *  (I .EQ. 5))  DDEPTH = (DEPMAX - WEIRHT)/7.0                     STRD243
        DUMDEP(I) = DUMDEP(I-1) + DDEPTH                                 STRD244
        DEPTH  = DUMDEP(I)                                               STRD245
C                                                                        STRD246
      CALL INTERP(ACEPTH, AASURF, 11, DEPTH, AREA, KFLAG)                STRD247
C                                                                        STRD248
      IF (KFLAG .NE. 0)  GO TO 901                                       STRD249
        AREA2  = AREA                                                    STRD250
 3150   DUMSTR(I) = DUMSTR(I-1) + 0.5*DDEPTH*(AREA1+AREA2)               STRD251
      WRITE(6,631)                                                       STRD252
  631 FORMAT(' ', 20X, 4('DEPTH(FT) STOR(CU.FT)', 4X))                   STRD253
      WRITE(6,632)  (DUMDEP(I), DUMSTR(I),  I=1,11)                      STRD254
  632 FORMAT(    ' ', 18X, F9.2, F11.0, 5X, F9.2, F11.0, 5X,             STRD255
     *                     F9.2, F11.0, 5X, F9.2, F11.0)                 STRD256
      GO TO 3300                                                         STRD257
C                                                                        STRD258
C---------           B)  FOR MAN-MADE RESERVOIR                          STRD259
C                                                                        STRD260
 3200   DDEPTH = DEPMAX/10.0                                             STRD261
      IF (ISTCUT .EQ. 2 .OR. ISTOUT .EQ. 3)                              STRD262
     *  DDEPTH = WEIRHT/3.0                                             STRD263
        DUMDEP(1) = 0.0                                                  STRD264
      DEPTH = 0.0                                                        STRD265
        DUMSTR(1) = 0.0                                                  STRD266
      DO 3250  I=2,11                                                    STRD267
      IF ((ISTCUT .EQ. 2 .OR. ISTOUT .EQ. 3) .AND.                       STRD268
     *  (I .EQ. 5))  DDEPTH = (DEPMAX - WEIRHT)/7.0                     STRD269
        DUMDEP(I) = DUMDEP(I-1) + DDEPTH                                 STRD270
 3250   DUMSTR(I) = (BASEA + 0.5*BASEC*DUMDEP(I)*COTSLO)*DUMDEP(I)       STRD271
      WRITE(6,631)                                                       STRD272
      WRITE(6,632)  (DUMDEP(I), DUMSTR(I),  I=1,11)                      STRD273
C                                                                        STRD274
 3300 DO 3350  I=1,11                                                    STRD275
        BSTOR(I)  = DUMSTR(I)                                            STRD276
 3350   BDEPTH(I) = DUMDEP(I)                                            STRD277
C                                                                        STRD278
C     CALL INTERP(BDEPTH,BSTOR,11,DEPMAX,STORMX,KFLAG)                   STRD279
      STORMX=BSTOR(11)                                                   STRD280
C                                                                        STRD281
C     IF (KFLAG .NE. 0)  GO TO 901                                       STRD282
C                                                                        STRD283
C                    END OF DEPTH/STORAGE COMPUTATIONS                   STRD284
C                                                                        STRD285
C------------------ BRANCH TO STORAGE MODE (ISTMOD) --------------------STRD286
C                                                                        STRD287
      IF (ISTMOD .EQ. 1)  GO TO 4000                                     STRD288
CC    IF (ISTMOD .EQ. 2)  GO TO                                          STRD289
CC    IF (ISTMOD .EQ. 3)  GO TO                                          STRD290
CC    IF (ISTMOD .EQ. 4)  GO TO                                          STRD291
      GO TO 905                                                          STRD292
C                                                                        STRD293
C------------------ COMPUTE AND PRINT ROUTING PARAMETERS ---------------STRD294
C                                                                        STRD295
C                    BRANCH TO OUTLET TYPE (ISTOUT)                      STRD296
C                                                                        STRD297
 4000 IF (ISTOUT .EQ. 1)  GO TO 4100                                     STRD298
      IF (ISTOUT .EQ. 2)  GO TO 4200                                     STRD299
CC    IF (ISTOUT .EQ. 3)  GO TO                                          STRD300
```

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CC     IF (ISTCUT .EQ. 4)  GO TO                                          STRD301
       IF (ISTCUT .EQ. 5)  GO TO 8000                                     STRD302
       IF (ISTCUT .EQ. 6)  GO TO 4600                                     STRD303
CC     IF (ISTCUT .EQ. 7)  GO TO                                          STRD304
CC     IF (ISTOUT .EQ. 8)  GO TO                                          STRD305
       GO TO 906                                                          STRD306
C                                                                         STRD307
C-------------        COMPUTE AND PRINT ROUTING PARAMETERS       --------- STRD308
C                                                                         STRD309
C---------            A)  FOR ORIFICE OUTLET                             STRD310
C                                                                         STRD311
 4100   DT2     = 0.5*DT                                                  STRD312
       DO 4150  I=1,11                                                    STRD313
         DEPTH  = DUMDEP(I)                                               STRD314
         STOR   = DUMSTR(I)                                               STRD315
         QOUT   = CDAOUT*SQRT(64.4*DEPTH)                                 STRD316
C                                                                         STRD317
         AO2DT2(I) = QOUT*DT2                                             STRD318
 4150    ATERM(I)  = QOUT*DT2 + STOR                                      STRD319
       WRITE(6,641)  DT, (ATERM(I), I=1,11),                              STRD320
      *                  (AO2DT2(I), I=1,11)                             STRD321
  641 FORMAT(' ', 20X, 'THE TWO SETS OF 11 STORAGE PARAMETERS, FOR DT ='STRD322
     *       , F10.3, ' SEC., ARE..',  /, ' ', 11X, 'ATERM.. ',         STRD323
     *              11F10.0,  /, ' ', 11X, 'AO2DT2..', 11F10.0)         STRD324
       GO TO 8000                                                         STRD325
C                                                                         STRD326
C---------            B)  FOR WEIR OUTLET                                STRD327
C                                                                         STRD328
 4200   DT2     = 0.5*DT                                                  STRD329
       DO 4250  I=1,11                                                    STRD330
         DEPTH  = DUMDEP(I)                                               STRD331
         STOR   = DUMSTR(I)                                               STRD332
         H      = DEPTH - WEIRHT                                          STRD333
         QOUT   = 0.0                                                     STRD334
       IF (H .GT. 0.0)  QOUT = WEIRL*3.33*H*SQRT(H)                       STRD335
C                                                                         STRD336
         AO2DT2(I) = QOUT*DT2                                             STRD337
 4250    ATERM(I)  = QOUT*DT2 + STOR                                      STRD338
       WRITE(6,641)  DT, (ATERM(I), I=1,11),                              STRD339
      *                  (AO2DT2(I), I=1,11)                             STRD340
       GO TO 8000                                                         STRD341
C                                                                         STRD342
C-------------         CHECK BUFFER VOLUME FOR PUMPED OUTFLOW     ---------STRD343
C                                                                         STRD344
 4600   DSTRT = CSTART                                                    STRD345
       CALL INTERP(DUMDEP, DUMSTR, 11, DSTRT, STORHI, KFLAG)              STRD346
C                                                                         STRD347
       IF (KFLAG .NE. 0)  GO TO 901                                       STRD348
C                                                                         STRD349
         DSTP = DSTOP                                                     STRD350
       CALL INTERP(DUMDEP, DUMSTR, 11, DSTP, STORLO, KFLAG)               STRD351
C                                                                         STRD352
       IF (KFLAG .NE. 0)  GO TO 901                                       STRD353
         STORDV = STORHI - STORLO                                         STRD354
         PUMPDV = QPUMP*DT                                                STRD355
         DVR    = STORDV/PUMPDV                                           STRD356
       IF (DVR .LT. 1.0)  GO TO 4650                                      STRD357
C                                                                         STRD358
       WRITE(6,646)  DVR                                                  STRD359
  646 FORMAT(' ', 20X, 'STORAGE BETWEEN PUMP START AND STOP LEVELS =',    STRD360
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     *       F12.2, ' TIMES (QPUMP*DT)')                                    STRD361
      GO TO 8000                                                            STRD362
C                                                                           STRD363
 4650 WRITE(6,647)  STORHI, STORLO, STORDV, PUMPDV                          STRD364
  647 FORMAT('0',20X, 'AT LEVEL DSTART, STORAGE    =', F10.0,' CU.FT',/,STRD365
     *       ' ',20X, 'AT LEVEL DSTOP,  STORAGE    =', F10.0,' CU.FT',/,STRD366
     *       ' ',20X, 'DIFFERENCE = BUFFER STORAGE =', F10.0,' CU.FT',/,STRD367
     *   '0',16X, 'CF. VOLUME PUMPED / TIME-STEP   =', F10.0,' CU.FT',/,STRD368
     *   '0',10X, 'A RELIABLE MODEL REQUIRES THE VOLUME PUMPED / TIME-',STRD369
     *   'STEP TO BE LESS THAN THE BUFFER STORAGE', /,                      STRD370
     *   ' ',10X, 'THEREFORE ONE OF THE FOLLOWING AMENDMENTS SHOULD ',      STRD371
     *   'PROBABLY BE MADE TO THE INPUT DATA -', /,                         STRD372
     *   ' ',15X, 'A)  REDUCE QPUMP RATE', /,                               STRD373
     *   ' ',15X, 'B)  REDUCE DSTOP LEVEL', /,                              STRD374
     *   ' ',15X, 'C)  INCREASE DSTART LEVEL', /,                           STRD375
     *   ' ',15X, 'D)  INCREASE RESERVOIR PLAN AREAS', /,                   STRD376
     *   '0', 2X, '****     FOR THE ABOVE REASONS, THE FOLLOWING OUTPUT',STRD377
     *   ' IS NOT NECESSARILY RELIABLE')                                    STRD378
      GO TO 8000                                                            STRD379
C                                                                           STRD380
C---------------- READ RESERVOIR INITIAL CONDITIONS ------------------STRD381
C                                                                           STRD382
C                   STORO  = STORAGE (CU.FT.) AT T = 0                      STRD383
C                   QOUTO  = OUTFLOW RATE (CFS) AT T = 0                    STRD384
 8000 READ(5,551)  STORO, QOUTO                                             STRD385
  551 FORMAT(2F10.2)                                                        STRD386
C                                                                           STRD387
C---------------- READ STORAGE UNIT UNIT COSTS ----------------------STRD388
C                                                                           STRD389
      READ(5,561)  CPCUYD                                                   STRD390
  561 FORMAT(F10.2)                                                         STRD391
      WRITE(6,661)  CPCUYD                                                  STRD392
  661 FORMAT(' ', 20X, 'ASSUMED UNIT COST (EXCAVATION, LINING, ETC.) =',STRD393
     *       F5.2, ' $/CU.YD.')                                             STRD394
C                                                                           STRD395
 8888 CONTINUE                                                              STRD396
C                                                                           STRD397
      GO TO 9999                                                            STRD398
C                                                                           STRD399
C---------------- ERROR MESSAGES -------------------------------------STRD400
C                                                                           STRD401
  901 IF (KFLAG .EQ. 10)  GO TO 902                                         STRD402
      WRITE(6,691)                                                          STRD403
  691 FORMAT('0 *** TERMINATE - INPUT TO INTERP PROCEDURE IS LESS THAN LSTRD404
     *OWEST VALUE ON CURVE (IN SUBRT. STRDAT)')                             STRD405
      STOP                                                                  STRD406
C                                                                           STRD407
  902 WRITE(6,692)                                                          STRD408
  692 FORMAT('0 *** TERMINATE - INPUT TO INTERP PROCEDURE IS GREATER THASTRD409
     *N LARGEST VALUE ON CURVE (IN SUBRT. STRDAT)')                         STRD410
      STOP                                                                  STRD411
C                                                                           STRD412
  903 WRITE(6,693)   DEPMAX, ADEPTH(11)                                     STRD413
  693 FORMAT('0THE MAX. DEPTH, DEPMAX =',                                   STRD414
     * F7.2, ' FT, IS OUTSIDE DEPTH PARAMETER RANGE.  LARGEST DEPTH PARASTRD415
     *METER, ADEPTH(11) =', F7.2)                                           STRD416
      STOP                                                                  STRD417
C                                                                           STRD418
  904 WRITE(6,694)  ISTTYP                                                  STRD419
  694 FORMAT('0 *** ISTTYP =', I3,                                          STRD420
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     * ', IS OF A TYPE NOT PRESENTLY MODELED')                          STRD421
      STOP                                                              STRD422
C                                                                       STRD423
  905 WRITE(6,695)  ISTMOD                                              STRD424
  695 FORMAT('0 *** ISTMOD =', I3,                                      STRD425
     *       ', IS OF A TYPE NOT PRESENTLY MODELED')                    STRD426
      STOP                                                              STRD427
C                                                                       STRD428
  906 WRITE(6,696)  ISTOUT                                              STRD429
  696 FORMAT('0 *** ISTOUT =', I3,                                      STRD430
     *       ', IS OF A TYPE NOT PRESENTLY MODELED')                    STRD431
      STOP                                                              STRD432
C                                                                       STRD433
  907 WRITE(6,697)  ISTINF                                              STRD434
  697 FORMAT('0 *** ISTINF =', I3,                                      STRD435
     *       ', IS OF A TYPE NOT PRESENTLY MODELED')                    STRD436
      STOP                                                              STRD437
C                                                                       STRD438
C                                                                       STRD439
 9999 DT=DT/60.0                                                        STRD440
      RETURN                                                            STRD441
      END                                                               STRD442
C=======================================================================STRD443
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      SUBROUTINE TREAT                                                  TREA   1
      COMMON   CONVER,KHOUR,KMIN,L,KMCD,NFLAG,BIG,HEAD1,HEAD2,          TREA   2
     *  QDESYN,CQIF,WAOU(7),WAIN(7),QQOU(7),QQIN(7),WARM(7),QQRL,       TREA   3
     *  BDIF,CORM(7),BDOU(7),BDIN(7),BCOU(7),BCIN(7),BDRL,              TREA   4
     *  SSIF,SSIN(7),SSOU(7),SCOU(7),SCIN(7),SSRM(7),SSRL,COIF,CORL,    TREA   5
     *  ADEPTH(11),AASURF(11),ITREAT(7),ISTOR,IPRINT,ICOST,HRFD,        TREA   6
     *  MODSIZ,ICHEM,ICL2,SCREEN,QQIFMX,DESF,IRANGE,KNTOF,TRIBA,SEDA,   TREA   7
     *  SQM,SREFFH,BREFFH,NUNITH,UAREAH,UPRAMA,ICHEMH,HM,VOLDAF,ITABLE, TREA   8
     *  MODCST,TOTCST,RECIRC,OVRDAF,TSURFA,OVRSED,NSED,JM(7),WTRMT5,    TREA   9
     *  NSCRA,SCRCAP,SUAREA,FAREAB,NMS,AREAMS,VOLCON,VOLSED,ALUMUT,     TREA  10
     *  BDINT(7),SSINT(7),WAINT(7),BDOUT(7),SSOUT(7),WAOUT(7),          TREA  11
     *  WARMT(7),BDRMT(7),SSRMT(7),CHEMUT(8),CL2UT(8),QMOD(20),WTRMT1,  TREA  12
     *  QQRMT(7),QQOUT(7),QCRMMX(7),QQOUMX(7),QQRMMN(7),QQOUMN(7),      TREA  13
     *  BCRMT(7),BCOUT(7),BCRMMX(7),BCOUMX(7),BCRMMN(7),BCOUMN(7),      TREA  14
     *  SCRMT(7),SCOUT(7),SCRMMX(7),SCOUMX(7),SCRMMN(7),SCOUMN(7),      TREA  15
     *  BDRM(7),BCRM(7),SCRM(7)                                         TREA  16
      COMMON   /TBLK/DT,NDT,KDT                                         TREA  17
      COMMON   /BLK1/NAME(4,21)                                         TREA  18
      COMMON   /STBK/QIN(150),BODIN(150),SUSIN(150),COLIN(150),         TREA  19
     *  QINST,CCUST,QINSTL,COUSTL,STORL,QOUTO,STORO,                    TREA  20
     *  ISPRIN,IPOL,DEPMAX,CCMAX,DEPTH,                                 TREA  21
     *  ATERM(11),AO2CT2(11),BDEPTH(11),BSTOR(11),                      TREA  22
     *  DUMSTR(11),DUMDEP(11),                                          TREA  23
     *  VOLIN(150),VOLOUT(150),STOR,CUMIN,CUMOUT,                       TREA  24
     *  SBOD,SSS,SCOL,BODOUT,SUSOUT,COLOUT,                             TREA  25
     *  ISTMOD,ISTTYP,ISTOUT,                                           TREA  26
     *  QPUMP,DSTART,CSTOP,                                             TREA  27
     *  DTON,STORMX,DTPUMP,DTMORE,STORF,APLAN,                          TREA  28
     *  CLAND,CSTOR,CPS,CTOTAL,CPCUYD,CPACRE,                           TREA  29
     *  LP,JP,LPREV,LABEL,DETENT(150),FRAC(150)                         TREA  30
      DIMENSION  NM(11),MHOUR(11),MMIN(11),BORD(11),SSRD(11),CORD(11),  TREA  31
     *           BDCIF(11),BDCRL(11),SSCIF(11),SSCRL(11),COCIF(11),     TREA  32
     *           COCRL(11),QAV(11)                                      TREA  33
C                                                                       TREA  34
      IF (KDT .GT. 1)  GO TO 10                                         TREA  35
C                                                                       TREA  36
C                    INITIALIZE                                         TREA  37
C                                                                       TREA  38
        BIG = 10.0**12                                                  TREA  39
        CORMT = 0.0                                                     TREA  40
        J1 = JM(1)                                                      TREA  41
        J3 = JM(3)                                                      TREA  42
        J4 = JM(4)                                                      TREA  43
        J5 = JM(5)                                                      TREA  44
        J7 = JM(7)                                                      TREA  45
      DO 5  K=1,7                                                       TREA  46
        BDINT(K) = 0.0                                                  TREA  47
        SSINT(K) = 0.0                                                  TREA  48
        WAINT(K) = 0.0                                                  TREA  49
        WARMT(K) = 0.0                                                  TREA  50
        BDRMT(K) = 0.0                                                  TREA  51
        SSRMT(K) = 0.0                                                  TREA  52
        BDOUT(K) = 0.0                                                  TREA  53
        SSOUT(K) = 0.0                                                  TREA  54
        WAOUT(K) = 0.0                                                  TREA  55
      IF (IRANGE .EQ. 0)  GO TO 5                                       TREA  56
        QQOUMX(K)= 0.0                                                  TREA  57
        BCOUMX(K)= 0.0                                                  TREA  58
        SCOUMX(K)= 0.0                                                  TREA  59
        QQRMMX(K)= 0.0                                                  TREA  60
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      BCRMMX(K)= 0.0                                                    TREA 61
      SCRMMX(K)= 0.0                                                    TREA 62
      QQOUT(K) = 0.0                                                    TREA 63
      BCOUT(K) = 0.0                                                    TREA 64
      SCOUT(K) = 0.0                                                    TREA 65
      QQRMT(K) = 0.0                                                    TREA 66
      BCRMT(K) = 0.0                                                    TREA 67
      SCRMT(K) = 0.0                                                    TREA 68
      QQOUMN(K)= BIG                                                    TREA 69
      BCOUMN(K)= BIG                                                    TREA 70
      SCOUMN(K)= BIG                                                    TREA 71
      QQRMMN(K)= BIG                                                    TREA 72
      BCRMMN(K)= BIG                                                    TREA 73
      SCRMMN(K)= BIG                                                    TREA 74
      CL2OT(K) = 0.0                                                    TREA 75
5     CHEMUT(K)= 0.0                                                    TREA 76
      CHEMUT(8)= 0.0                                                    TREA 77
      CL2OT(8) = 0.0                                                    TREA 78
      ALUMUT   = 0.0                                                    TREA 79
      IA=0                                                              TREA 80
      KNTOF = 0                                                         TREA 81
      SLOAD = 0.0                                                       TREA 82
      TCHEM = 0.0                                                       TREA 83
      CHCOST= 0.0                                                       TREA 84
      BDIFT = 0.0                                                       TREA 85
      SSIFT = 0.0                                                       TREA 86
      WAIFT = 0.0                                                       TREA 87
      BDOFT = 0.0                                                       TREA 88
      SSOFT = 0.0                                                       TREA 89
      WAOFT = 0.0                                                       TREA 90
      BDRLT = 0.0                                                       TREA 91
      SSRLT = 0.0                                                       TREA 92
      WARLT = 0.0                                                       TREA 93
      WARST = 0.0                                                       TREA 94
      BDRST = 0.0                                                       TREA 95
      SSRST = 0.0                                                       TREA 96
      COIFT = 0.0                                                       TREA 97
      COOFT = 0.0                                                       TREA 98
      COINT = 0.0                                                       TREA 99
      COOUT = 0.0                                                       TREA100
      CORLT = 0.0                                                       TREA101
C                                                                       TREA102
      IF (IRANGE .EQ. 0)  GO TO 7                                       TREA103
        QQIFMX = 0.0                                                    TREA104
        BCIFMX = 0.0                                                    TREA105
        SCIFMX = 0.0                                                    TREA106
        CCIFMX = 0.0                                                    TREA107
        QCOFMX = 0.0                                                    TREA108
        BCOFMX = 0.0                                                    TREA109
        SCOFMX = 0.0                                                    TREA110
        CCOFMX = 0.0                                                    TREA111
        QQINMX = 0.0                                                    TREA112
        BCINMX = 0.0                                                    TREA113
        SCINMX = 0.0                                                    TREA114
        CCINMX = 0.0                                                    TREA115
        QQRLMX = 0.0                                                    TREA116
        BCRLMX = 0.0                                                    TREA117
        SCRLMX = 0.0                                                    TREA118
        CCRLMX = 0.0                                                    TREA119
        CCOUMX = 0.0                                                    TREA120
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      QQIFMN = BIG                                                      TREA121
      BCIFMN = BIG                                                      TREA122
      SCIFMN = BIG                                                      TREA123
      CCIFMN = BIG                                                      TREA124
      QQOFMN = BIG                                                      TREA125
      BCOFMN = BIG                                                      TREA126
      SCOFMN = BIG                                                      TREA127
      CCOFMN = BIG                                                      TREA128
      QQINMN = BIG                                                      TREA129
      BCINMN = BIG                                                      TREA130
      SCINMN = BIG                                                      TREA131
      CCINMN = BIG                                                      TREA132
      QQRLMN = BIG                                                      TREA133
      BCRLMN = BIG                                                      TREA134
      SCRLMN = BIG                                                      TREA135
      CCRLMN = BIG                                                      TREA136
      CCOUMN = BIG                                                      TREA137
      QQIFT  = 0.0                                                      TREA138
      BCIFT  = 0.0                                                      TREA139
      SCIFT  = 0.0                                                      TREA140
      CCIFT  = 0.0                                                      TREA141
      QQOFT  = 0.0                                                      TREA142
      BCOFT  = 0.0                                                      TREA143
      SCOFT  = 0.0                                                      TREA144
      CCOFT  = 0.0                                                      TREA145
      QQINT  = 0.0                                                      TREA146
      BCINT  = 0.0                                                      TREA147
      SCINT  = 0.0                                                      TREA148
      CCINT  = 0.0                                                      TREA149
      QQRLT  = 0.0                                                      TREA150
      BCRLT  = 0.0                                                      TREA151
      SCRLT  = 0.0                                                      TREA152
      CCRLT  = 0.0                                                      TREA153
      CCOUT  = 0.0                                                      TREA154
C                                                                       TREA155
    7 RL     = NDT - 1                                                  TREA156
      ND     = RL/10.0                                                  TREA157
      NM(1) = 1                                                         TREA158
     DO 8  M=2,11                                                       TREA159
      MM     = M - 1                                                   TREA160
    8 NM(M) = ND*MM + 1                                                 TREA161
      M      = 1                                                       TREA162
     IF (IPRINT .EQ. 0)  GO TO 10                                       TREA163
     WRITE(6,457)                                                       TREA164
     IF (ITREAT(4) .EQ. 43 .AND. IPRINT .EQ. 2)  WRITE(6,458)           TREA165
     WRITE (6,459)  (NAME(I,J3), I=1,4), (NAME(I,J4), I=1,4),           TREA166
    *               (NAME(I,J7), I=1,4)                                 TREA167
  457 FORMAT('1PERFORMANCE PER TIME STEP', /,                           TREA168
    *       '0',10X,'NOTE:  NO BOD OR SS ARE REMOVED IN LEVELS 2,',     TREA169
    *       ' 5, & 6, REGARDLESS OF THE OPTIONS SELECTED', /, ' ', 17X,TREA170
    *       'NO SS REMOVALS IN LEVEL 7 (CHLORINE CONTACT TANK)', /,     TREA171
    *       ' ', 17X, 'LEVEL 1 & 5 REMOVALS (AT BAR RACKS AND ',       TREA172
    *       'EFFLUENT SCREENS) ARE REPORTED IN SUMMARY ONLY')           TREA173
  458 FORMAT(' ', 17X, '***** IN HIGH RATE FILTER REMOVALS INDICATES',  TREA174
    *       ' MATERIAL IN FILTER BED')                                  TREA175
  459 FORMAT('0 TIME', 16X, 'INFLOWS', 17X, 4A4, 3X, 4A4, 5X, 4A4,      TREA176
    *       13X, 'OUTFLOWS', /,                                         TREA177
    *       ' ',10X, ' -------------------------', 4X,                 TREA178
    *       3(' ------------------'), '----  ----------------------',TREA179
    *       '---', /, ' ', 11X, 'WATER   BOD    SS COLIFORMS', 4X,     TREA180
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     *       2(' TOTAL   BOD    SS'), ' TOTAL   BOD COLIFORMS',        TREA181
     *       ' TOTAL   BOD    SS COLIFORMS')                           TREA182
      IF (IPRINT .EQ. 1)  WRITE(6,460)                                 TREA183
  460 FORMAT(' HR:MIN        CF    LB    LB        MPN', 4X,           TREA184
     *       2('     CF    LB    LB'), '     CF    LB        MPN',     TREA185
     *       '     CF    LB    LB      MPN', //)                       TREA186
      IF (IPRINT .EQ. 2)  WRITE(6,461)                                 TREA187
  461 FORMAT(' HR:MIN       CFS  MG/L  MG/L MPN/100ML', 4X,            TREA188
     *       2('    CFS  MG/L  MG/L'), '    CFS  MG/L MPN/100ML',     TREA189
     *       '    CFS  MG/L  MG/L MPN/100ML')                          TREA190
C                                                                      TREA191
C                    COMPUTE CLOCK TIME                                TREA192
C                                                                      TREA193
   10   KMIN   = KMIN + DT                                             TREA194
   20 IF (KMIN .LT. 60)  GO TO 30                                      TREA195
        KMIN   = KMIN - 60                                             TREA196
        KHOUR  = KHOUR + 1                                             TREA197
      IF (KHOUR .GT. 23)  KHOUR = KHOUR - 24                           TREA198
      GO TO 20                                                         TREA199
   30 CONTINUE                                                         TREA200
C                                                                      TREA201
CC                   QQ..    = WATER FLOWRATE (CFS)                    TREA202
CC                   BO..    = BOD   FLOWRATE (LB/DT)                  TREA203
CC                   SS..    = SS    FLOWRATE (LB/DT)                  TREA204
CC                   CO..    = COLIFORM FLOW RATE (MPN/DT)             TREA205
CC                   WA..    = WATER QUANTITY (CU.FT)                  TREA206
CC                   BC..    = BOD CONCENTRATION (MG/L)                TREA207
CC                   SC..    = SS  CONCENTRATION (MG/L)                TREA208
CC                   CC..    = COLIFORMS CONCENTRATION (MPN/100ML)     TREA209
CC                                                                     TREA210
CC                   ..IF    = INFLOW (TO WHOLE MODEL, INCL OVERFLOW)  TREA211
CC                   ..OF    = OVERFLOW                                TREA212
CC                   ..IN    = INFLOW (BY LEVEL)                       TREA213
CC                   ..RM    = REMOVAL (BY LEVEL)    FROM EFFLUENT (OUTFLOTREA214
CC                   ..OU    = OUTFLOW (BY LEVEL)                      TREA215
CC                   ..RL    = RELEASE (OUTFLOW FROM WHOLE MODEL, INCL OVETREA216
CC                                                                     TREA217
CC                   ..RS    = REMOVAL BY SCREENS (SUBTOTALS FOR MODE 33 OTREA218
CC                   ..RD    = REDUCTION (PERCENT, OF A QUANTITY)      TREA219
CC                                                                     TREA220
CC                   ....T   = TOTAL (CUMULATIVE)                      TREA221
CC                   ....TT  = OVERALL TOTAL (FOR ALL LEVELS)          TREA222
CC                   ....RF  = REMOVAL FRACTION                        TREA223
CC                                                                     TREA224
CC                   ....MX  = MAXIMUM (THROUGHOUT STORM)              TREA225
CC                   ....MN  = MINIMUM (THROUGHOUT STORM)              TREA226
CC                                                                     TREA227
CC             NOTE:  INPUT TO TREATMENT IS INPUT TO LEVEL 1           TREA228
CC                                                                     TREA229
CC                  MG/L    = 16050*(LB/CU.FT.)                       TREA230
CC                                                                     TREA231
CC                  QDESYN = DESIGN THROUGH FLOWRATE FOR WHOLE TREATMENTTREA232
CC                                                                     TREA233
C                   COMPUTE OVERFLOW                                   TREA234
C                                                                      TREA235
       QQOF   = 0.0                                                    TREA236
       BDOF   = 0.0                                                    TREA237
       SSOF   = 0.0                                                    TREA238
       COOF   = 0.0                                                    TREA239
       WAOF   = 0.0                                                    TREA240
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        BCOF  = 0.0                                                     TREA241
        SCOF  = 0.0                                                     TREA242
        CCOF  = C.0                                                     TREA243
      IF (ITREAT(3) .EQ. 35)  GC TO (40, 35), ISTOR                     TREA244
C                     FLOW FIRST THROUGH ASSOCIATED STORAGE             TREA245
C                                                                       TREA246
   35 IF(ISTOR.NE.02)GO TO 40                                           TREA247
        QIN(KDT) = QQIF                                                 TREA248
        BODIN(KDT) = BDIF                                               TREA249
        SUSIN(KDT) = SSIF                                               TREA250
        COLIN(KDT) = COIF                                               TREA251
C                     ABOVE MAY NEED TO BE REDUCED BY NO-FLOOD FLOW SPLITTTREA252
C                     TO PREVENT FLOODING IN STORAGE                    TREA253
      IF (DEPTH .LT. DEPMAX)  GO TO 39                                  TREA254
      IF (QQIF .LE. 0.0)  GO TO 39                                      TREA255
        FR2ST       = COMAX/CQIF                                        TREA256
        QIN(KDT)    = FR2ST*CQIF                                        TREA257
        BODIN(KDT)  = FR2ST*BDIF                                        TREA258
        SUSIN(KDT)  = FR2ST*SSIF                                        TREA259
        COLIN(KDT)  = FR2ST*COIF                                        TREA260
        QQOF = (1.0-FR2ST)*CQIF                                         TREA261
        BDOF = (1.0-FR2ST)*BDIF                                         TREA262
        SSOF = (1.0-FR2ST)*SSIF                                         TREA263
        COOF = (1.0-FR2ST)*COIF                                         TREA264
   39   QINST     = QIN(KDT)                                           TREA265
C                                                                       TREA266
      CALL STRAGE                                                       TREA267
C                                                                       TREA268
        QQIF = COUST                                                    TREA269
        BDIF = BODOUT                                                   TREA270
        SSIF = SUSOUT                                                   TREA271
        COIF = COLOUT                                                   TREA272
C                     NO FLOW THROUGH ASSOCIATED STORAGE                TREA273
   40 IF (QQIF .GT. 0.0)  GO TO 50                                      TREA274
        WAIF  = 0.0                                                     TREA275
        BCIF  = 0.0                                                     TREA276
        SCIF  = 0.0                                                     TREA277
        COIF = 0.0                                                      TREA278
        CCIF  = 0.0                                                     TREA279
        QQIN(1) = 0.0                                                   TREA280
        WAIN(1) = 0.0                                                   TREA281
        BDIN(1) = 0.0                                                   TREA282
        COIN  = 0.0                                                     TREA283
        SSIN(1) = 0.0                                                   TREA284
        BCIN(1) = 0.0                                                   TREA285
        SCIN(1) = 0.0                                                   TREA286
        CCIN  = 0.0                                                     TREA287
      GO TO 80                                                          TREA288
   50   QQIN(1) = QDESYN                                                TREA289
      IF (QQIF .LT. QDESYN)  QQIN(1) = QQIF                             TREA290
        QQOFR = CCIF - CQIN(1)                                          TREA291
        QQOF  = CCOF + CQOFR                                            TREA292
        OFACT = CQOFR/QQIF                                              TREA293
C                     ASSUMES BOD, SS & COLIFORMS ARE THOROUGHLY MIXED ONTREA294
        BDOF  = OFACT*BDIF + BDOF                                       TREA295
        SSOF  = OFACT*SSIF + SSOF                                       TREA296
        COOF  = OFACT*COIF + COOF                                       TREA297
        WAOF  = QQOF*DT*60.0                                            TREA298
        WAOFT = WAOFT + WAOF                                            TREA299
        WAIF  = CQIF*DT*60.0                                            TREA300
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        BCIF   = 16050.0*BDIF/WAIF                                      TREA301
        SCIF   = 16050.0*SSIF/WAIF                                      TREA302
        CCIF   = COIF/(WAIF*28.32*10.0)                                 TREA303
      IF (CCOF .LT. 0.001)  GO TO 60                                    TREA304
        BCOF   = 16050.0*BDOF/WAOF                                      TREA305
        SCOF   = 16050.0*SSOF/WAOF                                      TREA306
        CCOF   = COOF/(WAOF*28.32*10.0)                                 TREA307
      KNTOF = KNTOF + 1                                                 TREA308
      GO TO 70                                                          TREA309
   60   BCOF   = 0.0                                                    TREA310
        SCOF   = 0.0                                                    TREA311
        CCOF   = 0.0                                                    TREA312
   70   BDOFT = BDOFT + BDOF                                            TREA313
        SSOFT = SSOFT + SSOF                                            TREA314
        COOFT = COOFT + COOF                                            TREA315
        BDIFT = BDIFT + BDIF                                            TREA316
        SSIFT = SSIFT + SSIF                                            TREA317
        WAIFT = WAIFT + WAIF                                            TREA318
        COIFT = COIFT + COIF                                            TREA319
        BDIN(1) = (1.0-CFACT)*BCIF                                      TREA320
        SSIN(1) = (1.0-OFACT)*SSIF                                      TREA321
        COIN    = (1.0-OFACT)*COIF                                      TREA322
        COINT   = COINT + COIN                                          TREA323
        WAIN(1) = QQIN(1)*DT*60.0                                       TREA324
        BCIN(1) = BCIF                                                  TREA325
        SCIN(1) = SCIF                                                  TREA326
        CCIN    = CCIF                                                  TREA327
C                                                                       TREA328
   80 IF (IRANGE .EQ. 0)  GO TO 1000                                    TREA329
      IF (QQIF .GT. QQIFMX)  QQIFMX = QQIF                              TREA330
      IF (QQOF .GT. QOOFMX)  QQOFMX = QQOF                              TREA331
      IF (QQIN(1) .GT. QQINMX)  QQINMX = QQIN(1)                        TREA332
      IF (BCIF .GT. BCIFMX)  BCIFMX = BCIF                              TREA333
      IF (BCOF .GT. BCOFMX)  BCOFMX = BCOF                              TREA334
      IF (BCIN(1) .GT. BCINMX)  BCINMX = BCIN(1)                        TREA335
      IF (SCIF .GT. SCIFMX)  SCIFMX = SCIF                              TREA336
      IF (SCOF .GT. SCOFMX)  SCOFMX = SCOF                              TREA337
      IF (SCIN(1) .GT. SCINMX)  SCINMX = SCIN(1)                        TREA338
      IF (CCIF .GT. CCIFMX)  CCIFMX = CCIF                              TREA339
      IF (CCOF .GT. CCOFMX)  CCOFMX = CCOF                              TREA340
      IF (CCIN .GT. CCINMX)  CCINMX = CCIN                              TREA341
      IF (QQIF .LT. QQIFMN)  QQIFMN = QQIF                              TREA342
      IF (QQOF .LT. QQOFMN)  QQOFMN = QQOF                              TREA343
      IF (QQIN(1) .LT. QQINMN)  QQINMN = QQIN(1)                        TREA344
      IF (BCIF .LT. BCIFMN)  BCIFMN = BCIF                              TREA345
      IF (BCOF .LT. BCOFMN)  BCOFMN = BCOF                              TREA346
      IF (BCIN(1) .LT. BCINMN)  BCINMN = BCIN(1)                        TREA347
      IF (SCIF .LT. SCIFMN)  SCIFMN = SCIF                              TREA348
      IF (SCOF .LT. SCOFMN)  SCOFMN = SCOF                              TREA349
      IF (SCIN(1) .LT. SCINMN)  SCINMN = SCIN(1)                        TREA350
      IF (CCIF .LT. CCIFMN)  CCIFMN = CCIF                              TREA351
      IF (CCOF .LT. CCOFMN)  CCOFMN = CCOF                              TREA352
      IF (CCIN .LT. CCINMN)  CCINMN = CCIN                              TREA353
        QQIFT = QQIFT + QQIF                                            TREA354
        QQOFT = QQOFT + QQOF                                            TREA355
        QQINT = QQINT + QQIN(1)                                         TREA356
        BCIFT = BCIFT + BCIF                                            TREA357
        BCOFT = BCOFT + BCOF                                            TREA358
        BCINT = BCINT + BCIN(1)                                         TREA359
        SCIFT = SCIFT + SCIF                                            TREA360
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        SCOFT = SCOFT + SCOF                                                TREA361
        SCINT = SCINT + SCIN(1)                                             TREA362
        CCIFT = CCIFT + CCIF                                                TREA363
        CCOFT = CCOFT + CCOF                                                TREA364
        CCINT = CCINT + CCIN                                                TREA365
C                                                                           TREA366
      IF(ISTOR.NE.02)GO TO 1000                                             TREA367
      IF (QOUST .EQ. 0.0) GO TO 9998                                        TREA368
C----------------  START REMOVALS. IN CASCADING LEVELS  ----------------TREA369
C                                                                           TREA370
C---------          LEVEL 1 BRANCH (FOR TREATMENT BY BAR RACKS)            TREA371
C                                                                           TREA372
 1000 IF(QQIF.LE.0.0)  GO TO 9998                                           TREA373
        K = ITREAT(1) - 10                                                  TREA374
        L = 1                                                               TREA375
        BDINT(1) = BDINT(1) + BDIN(1)                                       TREA376
        SSINT(1) = SSINT(1) + SSIN(1)                                       TREA377
        WAINT(1) = WAINT(1) + WAIN(1)                                       TREA378
      GO TO (1100,1200), K                                                  TREA379
C                                                                           TREA380
C                    11)  FOR NO BAR RACKS                                  TREA381
C                                                                           TREA382
 1100 CALL BYPASS                                                           TREA383
      GO TO 1900                                                            TREA384
C                                                                           TREA385
C                    12)  FOR BAR RACKS                                     TREA386
C                                                                           TREA387
 1200   WARM(1) = 6.0*QQIN(1)*0.646*DT/1440.0                               TREA388
        QQRM(1) = WARM(1)/(DT*60.0)                                         TREA389
C                       SCREENINGS (85% MOISTURE) AT 6 CU.FT/MG, & 50 LB/CTREA390
        SSRM(1) = WARM(1)*50.0*0.15                                         TREA391
        BDRM(1) = 0.05*SSRM(1)                                              TREA392
        QQOU(1) = QQIN(1) - QQRM(1)                                         TREA393
        WAOU(1) = WAIN(1) - WARM(1)                                         TREA394
        BDOU(1) = BDIN(1) - BDRM(1)                                         TREA395
        SSOU(1) = SSIN(1) - SSRM                                            TREA396
C                                                                           TREA397
 1220 IF (QQOU(1) .EQ. 0.0)  GO TO  230                                     TREA398
        BOOU(1) = BDOU(1)*CONVER/QQOU(1)                                    TREA399
        SOOU(1) = SSOU(1)*CONVER/QQOU(1)                                    TREA400
      GO TO 1240                                                            TREA401
 1230   BOOU(1) = 0.0                                                       TREA402
        SOOU(1) = 0.0                                                       TREA403
 1240 IF (QQRM(1) .EQ. 0.0)  GO TO 1250                                     TREA404
        BORM(1) = BDRM(1)*CONVER/QQRM(1)                                    TREA405
        SORM(1) = SSRM(1)*CONVER/QQRM(1)                                    TREA406
      GO TO 1900                                                            TREA407
 1250   BORM(1) = 0.0                                                       TREA408
        SORM(1) = 0.0                                                       TREA409
C                                                                           TREA410
 1900 CALL TRLINK                                                           TREA411
C                                                                           TREA412
C---------          LEVEL 2 BRANCH (FOR INLET PUMPING)                     TREA413
C                                                                           TREA414
 2000   K = ITREAT(2) - 20                                                  TREA415
        L = 2                                                               TREA416
        BDINT(2) = BDINT(2) + BDIN(2)                                       TREA417
        SSINT(2) = SSINT(2) + SSIN(2)                                       TREA418
        WAINT(2) = WAINT(2) + WAIN(2)                                       TREA419
      GO TO (2100,2200), K                                                  TREA420
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C                                                                       TREA421
C                    21)  FOR GRAVITY INLET (NO PUMPING, = BYPASS)      TREA422
C                                                                       TREA423
 2100 CALL BYPASS                                                       TREA424
      GO TO 2900                                                        TREA425
C                                                                       TREA426
C                    22)  FOR INLET PUMPING (STATION)                   TREA427
C                                                                       TREA428
 2200 CALL BYPASS                                                       TREA429
C                                                                       TREA430
 2900 CALL TRLINK                                                       TREA431
C                                                                       TREA432
C---------           LEVEL 3 BRANCH (FOR PRIMARY TREATMENT)             TREA433
C                                                                       TREA434
 3000   K = ITREAT(3) - 30                                             TREA435
        L = 3                                                           TREA436
        BDINT(3) = BDINT(3) + BDIN(3)                                   TREA437
        SSINT(3) = SSINT(3) + SSIN(3)                                   TREA438
        WAINT(3) = WAINT(3) + WAIN(3)                                   TREA439
      GO TO (3100,3200,3400,3400,3500), K                               TREA440
C                                                                       TREA441
C                    31)  FOR NO PRIMARY TREATMENT (BYPASS)             TREA442
C                                                                       TREA443
 3100 CALL BYPASS                                                       TREA444
      GO TO 3900                                                        TREA445
C                                                                       TREA446
C                    32) & 33)  FOR DISSOLVED AIR FLOATATION            TREA447
C                               (WITH OR WITHOUT CHEMICALS)             TREA448
C                                                                       TREA449
C  SELECT CONTINUATION THRU PROGRAM DEPENDING ON USE OR NON-USE OF      TREA450
C     CHEMICAL COAGULANTS                                               TREA451
 3200   OVFRA  = QQIN(3)*1000000.0*(1.0+0.01*RECIRC)/(1.547*TSJRFA)     TREA452
C                    OVFRA    OVERFLOW RATE, GPD/SF                     TREA453
C                                                                       TREA454
C *** COMPUTE REMOVALS IN FLOTATION CHAMBER ASSUMING NO FLOC. CHEMICALS TREA455
C                                                                       TREA456
      IF (OVFRA .LT. 1000.0)  OVFRA = 1000.0                            TREA457
        BREFF  = 0.59 + 0.05*BCIN(3)/100.0 - 0.36*(OVFRA-1000.0)/7000.0 TREA458
        SREFF  = 0.656 + 0.06*SCIN(3)/190.0 - 0.40*(OVFRA-1000.0)/7000.0TREA459
      IF (ICHEM .NE. 1)  GO TO 3205                                     TREA460
C                                                                       TREA461
C *** COMPUTE REMOVALS IN FLOTATION CHAMBER ASSUMING FLOC CHEMICALS ARE TREA462
C                                                                       TREA463
        BREFF  = BREFF + 0.02                                           TREA464
        SREFF  = SREFF + (20000.0-OVFRA)/100000.0                       TREA465
      CHEMU=QQIN(3)*DT*60.0*7.48*100.0/1000000.                         TREA466
        CHEMUT(3) = CHEMUT(3) + CHEMU                                   TREA467
 3205 IF (ICL2 .NE. 1)  GO TO 3210                                      TREA468
        BREFF  = BREFF + 0.15                                           TREA469
C                    ADDED CL2 REDUCES BOD & COLIFORMS BUT DOES NOT AFFECTREA470
      IF (BCIN(3) .GT. 130.0)  CL2U = QQIN(3)*15.0*8.34*DT/             TREA471
     *                                (1.547*60.0*24.0)                 TREA472
      IF (BCIN(3) .LE. 130.0)  CL2U = QQIN(3)*10.0*8.34*DT/             TREA473
     *                                (1.547*60.0*24.0)                 TREA474
        CL2UT(3) = CL2UT(3) + CL2U                                      TREA475
      CALL KILL(VCLDAF,SCIF,SCIN(3),QQIN(3),CCIN,CCOU)                  TREA476
 3210 CONTINUE                                                          TREA477
      IF (BREFF .GE. 0.60)  BREFF = 0.60                                TREA478
      IF (BREFF .LE. 0.18)  BREFF = 0.18                                TREA479
      IF (SREFF .GE. 0.82)  SREFF = 0.82                                TREA480
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      IF (SREFF .LE. 0.20)  SREFF = 0.20                                    TREA481
        BDRM(3)  = BREFF*BDIN(3)                                            TREA482
        SSRM(3)  = SREFF*SSIN(3)                                            TREA483
        QQRM(3)  = 0.015*QQIN(3)                                            TREA484
C  QQRM(3) IS FLOATED SCUM VOLUME                                           TREA485
      GO TO 3220                                                            TREA486
C                                                                           TREA487
 3203   QQUS    = QQIN(3) - QQRS                                            TREA488
        OVFRA   = QQUS*1000000.0*(1.0+0.01*RECIRC)/(1.547*TSJRFA)           TREA489
      IF (OVFRA .LT. 1000.0)  OVFRA = 1000.0                                TREA490
C                    NC CHEMICALS USED                                      TREA491
        BDQUS   = BDIN(3) - BDRS                                            TREA492
        BCQUS   = 0.0                                                       TREA493
      IF (QQUS .GT. 0.0)  BCQUS = BDQUS*CONVER/QQUS                         TREA494
        SSQUS   = SSIN(3) - SSRS                                            TREA495
        SCQUS   = 0.0                                                       TREA496
      IF (QQUS .GT. 0.0)  SCQUS = SSQUS*CONVER/QQUS                         TREA497
        SREFF   = 0.528 - 0.486*(OVFRA-1000.0)/7000.0 + 0.06*SCQUS/190.0TREA498
        BREFF   = 0.475 + 0.05*BCQUS/100.0 - 0.405*(OVFRA-1000.0)/7000.0TREA499
      IF (ICHEM .NE. 1)  GO TO 3215                                         TREA500
C                    CHEMICALS USED                                         TREA501
        SREFF   = SREFF + 1.37*(20000.0-OVFRA)/100000.0                     TREA502
        BREFF   = BREFF + 1.30*0.02                                         TREA503
        CHEMU   = QQUS*DT*60.0*7.48*100.0/1000000.0                         TREA504
C                                                                           TREA505
C          CHEMU IS CHEMICALS USED PER TIMESTEP BASED ON USE AT 12 MG/L     TREA506
        CHEMUT(3) = CHEMUT(3) + CHEMU                                       TREA507
 3215 IF (ICL2 .NE. 1)  GO TO 3219                                          TREA508
        BREFF   = BREFF + 0.15*1.30                                         TREA509
C                    CL2 REDUCES BOD & COLIFORMS, BUT NOT SS                TREA510
      IF (BCQUS .GT. 130.0)  CL2U = QQUS*15.0*8.34*DT/                      TREA511
     *                              (1.547*60.0*24.0)                       TREA512
      IF (BCQUS .LE. 130.0)  CL2U = QQUS*10.0*8.34*DT/                      TREA513
     *                              (1.547*60.0*24.0)                       TREA514
        CL2LT(3) = CL2UT(3) + CL2U                                          TREA515
      CALL KILL(VCLDAF,SCIF,SCIN(3),QQIN(3),CCIN,CCOU)                      TREA516
 3219 CONTINUE                                                              TREA517
      IF (BREFF .GT. 0.48)  BREFF = 0.48                                    TREA518
      IF (BREFF .LT. 0.15)  BREFF = 0.15                                    TREA519
      IF (SREFF .GT. 0.75)  SREFF = 0.75                                    TREA520
      IF (SREFF .LT. 0.15)  SREFF = 0.15                                    TREA521
        BDRM(3) = BDRS + BREFF*BDQUS                                        TREA522
        SSRM(3) = SSRS + SREFF*SSQUS                                        TREA523
        QQRM(3) = QQRS + QQUS*0.010                                         TREA524
 3220   QQQU(3) = QQIN(3) - QQRM(3)                                         TREA525
        WAQU(3) = QQQU(3)*DT*60.0                                           TREA526
        BDQU(3) = BDIN(3) - BDRM(3)                                         TREA527
        SSQU(3) = SSIN(3) - SSRM(3)                                         TREA528
        WARM(3) = WAIN(3) - WAQU(3)                                         TREA529
C                                                                           TREA530
      IF (QQQU(3) .EQ. 0.0)  GO TO 3230                                     TREA531
        BCQU(3) = BDQU(3)*CONVER/QQQU(3)                                    TREA532
        SCQU(3) = SSQU(3)*CONVER/QQQU(3)                                    TREA533
      GO TO 3240                                                            TREA534
 3230   BCQU(3) = 0.0                                                       TREA535
        SCQU(3) = 0.0                                                       TREA536
 3240 IF (QQRM(3) .EQ. 0.0)  GO TO 3250                                     TREA537
        BCRM(3) = BDRM(3)*CONVER/QQRM(3)                                    TREA538
        SCRM(3) = SSRM(3)*CONVER/QQRM(3)                                    TREA539
      GO TO 3900                                                            TREA540
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 3250   BCRM(3) = 0.0                                                          TREA541
        SCRM(3) = 0.0                                                          TREA542
      GO TO 3900                                                               TREA543
C                                                                              TREA544
C                    33) & 34)  FOR FINE SCREENS                               TREA545
C                                                                              TREA546
 3400   BDRM(3) = 0.2200*BDIN(3)                                               TREA547
        SSRM(3) = 0.2700*SSIN(3)                                               TREA548
        QQRM(3) = 0.0075*QQIN(3)                                               TREA549
        WARM(3) = QQRM(3)*DT*60.0                                              TREA550
        WARS = WARM(3)                                                         TREA551
        BDRS = BDRM(3)                                                         TREA552
        SSRS = SSRM(3)                                                         TREA553
        QQRS = QQRM(3)                                                         TREA554
      IF (ITREAT(3) .EQ. 33)  GO TO 3440                                       TREA555
        QQOU(3) = QQIN(3) - QQRM(3)                                            TREA556
        WAOU(3) = QQOU(3)*DT*60.0                                              TREA557
        BDOU(3) = BDIN(3) - BDRM(3)                                            TREA558
        SSOU(3) = SSIN(3) - SSRM(3)                                            TREA559
      IF (QQOU(3) .EQ. 0.0)  GO TO 3410                                        TREA560
        BOOU(3) = BDOU(3)*CONVER/QQOU(3)                                       TREA561
        SOOU(3) = SSOU(3)*CONVER/QQOU(3)                                       TREA562
      GO TO 3420                                                               TREA563
 3410   BOOU(3) = 0.0                                                          TREA564
        SOOU(3) = 0.0                                                          TREA565
C  BCRM(3) AND SCRM(3) ARE THE CONCENTRATION OF BOD & SS IN THE SCREENIN       TREA566
 3420 IF (QQRM(3) .EQ. 0.0)  GO TO 3430                                        TREA567
        BCRM(3) = BDRM(3)*CONVER/QQRM(3)                                       TREA568
        SCRM(3) = SSRM(3)*CONVER/QQRM(3)                                       TREA569
      GO TO 3440                                                               TREA570
 3430   BCRM(3) = 0.0                                                          TREA571
        SCRM(3) = 0.0                                                          TREA572
 3440   SLOAD   = SSIN(3)/(DT*SCREEN)                                          TREA573
C                    SLOAD  = SOLIDS LOADING ON SCREENS (LB/MIN/SQ.FT)         TREA574
      IF(SLOAD .GT. 0.14)  IA=1                                                TREA575
      IF (ITREAT(3) .NE. 33)  GO TO 3900                                       TREA576
        WARST = WARST + WARS                                                   TREA577
        BDRST = BDRST + BDRS                                                   TREA578
        SSRST = SSRST + SSRS                                                   TREA579
      GO TO 3203                                                               TREA580
C                                                                              TREA581
C                    35)  FOR SEDIMENTATION                                    TREA582
C                                                                              TREA583
 3500 CALL SEDIM                                                               TREA584
C                                                                              TREA585
 3900 CALL TRLINK                                                              TREA586
C                                                                              TREA587
C---------          LEVEL 4 BRANCH (FOR SECONDARY TREATMENT)                   TREA588
C                                                                              TREA589
 4000   K = ITREAT(4) - 40                                                     TREA590
        L = 4                                                                  TREA591
        BDINT(4) = BDINT(4) + BDIN(4)                                          TREA592
        SSINT(4) = SSINT(4) + SSIN(4)                                          TREA593
        WAINT(4) = WAINT(4) + WAIN(4)                                          TREA594
      GO TO (4100,4200,4300), K                                                TREA595
C                                                                              TREA596
C                    41)  FOR NO SECONDARY TREATMENT (BYPASS)                  TREA597
C                                                                              TREA598
 4100 CALL BYPASS                                                              TREA599
      GO TO 4900                                                               TREA600
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C                                                                       TREA601
C                    42)  FOR MICROSTRAINERS                            TREA602
C                                                                       TREA603
 4200   FMS    = SQRT(400.0/TRIBA)                                      TREA604
      IF (FMS .GT. 1.0)  FMS = 1.0                                      TREA605
C                                                                       TREA606
      IF (SCIN(4) .LE. 70.0)  SCRM1 = SCIN(4)*SCIN(4)/140.0             TREA607
      IF (SCIN(4) .GT. 70.0)  SCRM1 = SCIN(4) - 35.0                    TREA608
        GPMSF  = 10000.0*FMS/SCRM1                                      TREA609
      IF (GPMSF .GE. 40.0)  GPMSF = 40.0                                TREA610
        CFSTR  = GPMSF*AREAMS*NMS/449.0                                 TREA611
      IF (CFSTR .GT. QQIN(4))  CFSTR = QQIN(4)                          TREA612
        CFSOF  = QQIN(4) - CFSTR                                        TREA613
        QQRM(4)= 0.10*NMS                                               TREA614
        QQOU(4)= QQIN(4) - QQRM(4)                                      TREA615
        WARM(4)= QQRM(4)*DT*60.0                                        TREA616
        WAOU(4)= QQOU(4)*DT*60.0                                        TREA617
        CFSTR2 = CFSTR - QQRM(4)                                        TREA618
        PSSTR  = CFSTR2*(SCIN(4)-SCRM1)*0.646*8.35*DT/1440.0            TREA619
        PSSOF  = CFSOF*SCIN(4)*0.646*8.35*DT/1440.0                     TREA620
        SSOU(4)= PSSTR + PSSOF                                          TREA621
        SSRM(4)= SSIN(4) - SSOU(4)                                      TREA622
        SCOU(4)= SSOU(4)/(QQOU(4)*0.646*8.35*DT/1440.0)                 TREA623
        SCRM(4)= SSRM(4)/(0.10*NMS*0.646*8.35*DT/1440.0)                TREA624
C                                                                       TREA625
      IF (BCIN(4) .GE. 27.0)  BCRM1 = BCIN(4) - 10.0                    TREA626
      IF (BCIN(4) .LT. 27.0)  BCRM1 = BCIN(4)*17.0/27.0                 TREA627
        PBDTR  = CFSTR2*(BCIN(4)-BCRM1)*0.646*8.35*DT/1440.0            TREA628
        PBDOF  = CFSOF*BCIN(4)*0.646*8.35*DT/1440.0                     TREA629
        BDOU(4)= PBDTR + PBDOF                                          TREA630
        BDRM(4)= BDIN(4) - BDOU(4)                                      TREA631
        BCOU(4)= BDOU(4)/(QQOU(4)*0.646*8.35*DT/1440.0)                 TREA632
        BCRM(4)= BDRM(4)/(0.10*NMS*0.646*8.35*DT/1440.0)                TREA633
      GO TO 4900                                                        TREA634
C                                                                       TREA635
C                    43)  FOR HIGH RATE FILTERS                         TREA636
C                                                                       TREA637
 4300 CALL HIGHRF                                                       TREA638
C                                                                       TREA639
 4900 CALL TRLINK                                                       TREA640
C                                                                       TREA641
C---------           LEVEL 5 BRANCH FOR EFFLUENT SCREENS                TREA642
C                                                                       TREA643
 5000   K = ITREAT(5) - 50                                              TREA644
        L = 5                                                           TREA645
        BDINT(5) = BDINT(5) + BDIN(5)                                   TREA646
        SSINT(5) = SSINT(5) + SSIN(5)                                   TREA647
        WAINT(5) = WAINT(5) + WAIN(5)                                   TREA648
      GO TO (5100,5200), K                                              TREA649
C                                                                       TREA650
C                    51)  FOR NO EFFLUENT SCREENS (BYPASS)              TREA651
C                                                                       TREA652
 5100 CALL BYPASS                                                       TREA653
      GO TO 5900                                                        TREA654
C                                                                       TREA655
C                    52)  FOR EFFLUENT SCREENS                          TREA656
C                                                                       TREA657
C                    SCREENINGS VOLUME AT 0.05 CU.FT/M.G.               TREA658
C                                                                       TREA659
 5200   WARM(5) = 0.000000374*WAIN(5)                                   TREA660
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          SSRM(5) = WARM(5)*50.0*0.15                                    TREA661
          BDRM(5) = 0.05*SSRM(5)                                         TREA662
          QQRM(5) = WARM(5)/(DT*60.0)                                    TREA663
          WAOU(5) = WAIN(5) - WARM(5)                                    TREA664
          BDOU(5) = BDIN(5) - BDRM(5)                                    TREA665
          SSOU(5) = SSIN(5) - SSRM(5)                                    TREA666
          QQOU(5) = QQIN(5) - QQRM(5)                                    TREA667
   5220 IF (QQOU(5) .EQ. 0.0)  GO TO 5230                                TREA668
          BCOU(5) = BDOU(5)*CONVER/QQOU(5)                               TREA669
          SCOU(5) = SSOU(5)*CONVER/QQOU(5)                               TREA670
        GO TO 5240                                                       TREA671
   5230   BCOU(5) = 0.0                                                 TREA672
          SCOU(5) = 0.0                                                  TREA673
   5240 IF (QQRM(5) .EQ. 0.0)  GO TO 5250                                TREA674
          BCRM(5) = BDRM(5)*CONVER/QQRM(5)                               TREA675
          SCRM(5) = SSRM(5)*CONVER/QQRM(5)                               TREA676
        GO TO 5900                                                       TREA677
   5250   BCRM(5) = 0.0                                                 TREA678
          SCRM(5) = 0.0                                                  TREA679
C                                                                        TREA680
C                                                                        TREA681
 5900 CALL TRLINK                                                        TREA682
C                                                                        TREA683
C---------          LEVEL 6 BRANCH (FOR OUTLET PUMPING)                  TREA684
C                                                                        TREA685
 6000   K = ITREAT(6) - 60                                               TREA686
        L = 6                                                            TREA687
        BDINT(6) = BDINT(6) + BDIN(6)                                    TREA688
        SSINT(6) = SSINT(6) + SSIN(6)                                    TREA689
        WAINT(6) = WAINT(6) + WAIN(6)                                    TREA690
      GO TO (6100,6200), K                                               TREA691
C                                                                        TREA692
C                   61)  FOR GRAVITY OUTLET (NO PUMPING, = BYPASS)       TREA693
C                                                                        TREA694
 6100 CALL BYPASS                                                        TREA695
      GO TO 6900                                                         TREA696
C                                                                        TREA697
C                   62)  FOR OUTLET PUMPING (STATION)                    TREA698
C                                                                        TREA699
 6200 CALL BYPASS                                                        TREA700
C                                                                        TREA701
 6900 CALL TRLINK                                                        TREA702
C                                                                        TREA703
C---------          LEVEL 7 BRANCH (FOR CHLORINE CONTACT TIME)           TREA704
C                                                                        TREA705
 7000   K = ITREAT(7) - 70                                               TREA706
        L = 7                                                            TREA707
        BDINT(7) = BDINT(7) + BDIN(7)                                    TREA708
        SSINT(7) = SSINT(7) + SSIN(7)                                    TREA709
        WAINT(7) = WAINT(7) + WAIN(7)                                    TREA710
      GO TO (7100,7200), K                                               TREA711
C                                                                        TREA712
C                   71)  FOR NO CONTACT TANK (BYPASS)                    TREA713
C                                                                        TREA714
 7100 IF (ITREAT(3) .EQ. 32 .OR. ITREAT(3) .EQ. 33 .OR.                  TREA715
     *    ITREAT(3) .EQ. 35)  GO TO 7110                                 TREA716
      GO TO 7120                                                         TREA717
 7110 IF (ICL2 .GT. 0)  GO TO 7150                                       TREA718
C                   IF NO CHLORINATION ELSEWHERE,REDUCE COLIFORMS BY SS  TREA719
 7120 IF (SCIF .EQ. 0.0)  GO TO 7130                                     TREA720
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        CCOU = CCIN*SCIN(7)/SCIF                                        TREA721
      GO TO 7150                                                        TREA722
 7130   CCOU = CCIN                                                     TREA723
C                                                                       TREA724
 7150 CALL BYPASS                                                       TREA725
      GO TO 7900                                                        TREA726
C                                                                       TREA727
C                    721  FOR CHLORINE CONTACT TANK                    TREA728
C                                                                       TREA729
 7200   CL2DEM = BCIN(7)/10.0                                           TREA730
      IF (CL2DEM .LT.  6.0)  CL2DEM =  6.0                              TREA731
      IF (CL2DEM .GT. 25.0)  CL2DEM = 25.0                              TREA732
        PCL2DM = CL2DEM*QQIN(7)*0.646*8.35                              TREA733
        CL2UC  = PCL2DM*DT/1440.0                                       TREA734
        CL2UT(7) = CL2UT(7) + CL2UC                                     TREA735
C                                                                       TREA736
        BCREDU  = 2.0*CL2DEM                                            TREA737
      IF (BCREDU .GT. BCIN(7))  BCREDU = 0.50*BCIN(7)                   TREA738
        BCOU(7) = BCIN(7) - BCREDU                                      TREA739
        QQRM(7) = 0.0                                                   TREA740
        QQOU(7) = QQIN(7)                                               TREA741
        WARM(7) = 0.0                                                   TREA742
        WAOU(7) = WAIN(7)                                               TREA743
        SSOU(7) = SSIN(7)                                               TREA744
        SSRM(7) = 0.0                                                   TREA745
        SCOU(7) = SCIN(7)                                               TREA746
        SCRM(7) = 0.0                                                   TREA747
        BDOU(7) = WAOU(7)*BCOU(7)/16050.0                               TREA748
        BDRM(7) = BDIN(7) - BDOU(7)                                     TREA749
        BCRM(7) = 0.0                                                   TREA750
C                                                                       TREA751
      CALL KILL(VOLCON,SCIF,SCIN(7),QQIN(7),CCIN,CCOU)                  TREA752
C                                                                       TREA753
 7900 CALL TRLINK                                                       TREA754
C                                                                       TREA755
      GO TO 8000                                                        TREA756
 9998 QQOU(7)=0.0                                                       TREA757
      SCRM(7)=0.0                                                       TREA758
      BCRM(7)=0.0                                                       TREA759
      SCOU(7)=0.0                                                       TREA760
      BCOU(7)=0.0                                                       TREA761
      WAOU(7)=0.0                                                       TREA762
      QQRM(7)=0.0                                                       TREA763
      WARM(7)=0.0                                                       TREA764
      SSOU(7)=0.0                                                       TREA765
      SSRM(7)=0.0                                                       TREA766
      BDOU(7)=0.0                                                       TREA767
      BDRM(7)=0.0                                                       TREA768
      CCOU=0.0                                                          TREA769
C---------           COMBINE LEVEL 7 OUTFLOW WITH OVERFLOW, TO COMPUTE RETREA770
C                                                                       TREA771
 8000   QQRL = CCCU(7) + QQOF                                           TREA772
        BDRL = BDOU(7) + BDOF                                           TREA773
        SSRL = SSOU(7) + SSOF                                           TREA774
        WARL = WAOU(7) + WAOF                                           TREA775
        COOU = CCCU*DT*60.0*QQOU(7)*28.3*10.0                           TREA776
        CORL = COOU + COOF                                              TREA777
      IF (QQRL .LE. 0.0)  GO TO 8100                                    TREA778
        BCRL = BDRL*CONVER/CORL                                         TREA779
        SCRL = SSRL*CONVER/CORL                                         TREA780
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      CCRL = CORL/(DT*60.0*QQRL*28.32*10.0)
C??                                                                    TREA781
      GO TO 8200                                  CHLORINATE OVERFLOW ?? TREA782
 8100 BCRL = 0.0                                                       TREA783
      SCRL = 0.0                                                       TREA784
      CCRL = 0.0                                                       TREA785
C                                                                      TREA786
 8200 WARLT = WARLT + WARL                                             TREA787
      BDRLT = BDRLT + BDRL                                             TREA788
      SSRLT = SSRLT + SSRL                                             TREA789
      CORLT = CORLT + CORL                                             TREA790
C                                                                      TREA791
      CORM  = COIF - CORL                                              TREA792
      CORMT = CORMT + CORM                                             TREA793
      COOUT = COOUT + COOU                                             TREA794
      CCOUT = CCOUT + CCOU                                             TREA795
 8240 IF (IRANGE .EQ. 0)  GO TO 8300                                   TREA796
      IF (QQRL .GT. QQRLMX)  QQRLMX = QQRL                             TREA797
      IF (BCRL .GT. BCRLMX)  BCRLMX = BCRL                             TREA798
      IF (SCRL .GT. SCRLMX)  SCRLMX = SCRL                             TREA799
      IF (CCRL .GT. CCRLMX)  CCRLMX = CCRL                             TREA800
      IF (QQRL .LT. QQRLMN)  QQRLMN = QQRL                             TREA801
      IF (BCRL .LT. BCRLMN)  BCRLMN = BCRL                             TREA802
      IF (SCRL .LT. SCRLMN)  SCRLMN = SCRL                             TREA803
      IF (CCRL .LT. CCRLMN)  CCRLMN = CCRL                             TREA804
      IF (CCCU .GT. CCOUMX)  CCOUMX = CCOU                             TREA805
      IF (CCCU .LT. CCOUMN)  CCOUMN = CCOU                             TREA806
        QQRLT = QQRLT + QQRL                                           TREA807
        BCRLT = BCRLT + BCRL                                           TREA808
        SCRLT = SCRLT + SCRL                                           TREA809
        CCRLT = CCRLT + CCRL                                           TREA810
C                                                                      TREA811
C                                                                      TREA812
C                   COMPUTE POLLUTION REDUCTION AT 11 SELECTED TIMESTEPSTREA813
C                                                                      TREA814
 8300 IF (KDT .EQ. NM(M))  GO TO 8400                                  TREA815
      GO TO 9000                                                       TREA816
 8400 MHOUR(M) = KHOUR                                                 TREA817
      MMIN(M)  = KMIN                                                  TREA818
C                   WATER                                              TREA819
      QAV(M)   = 0.5*(QQIF+QQRL)                                       TREA820
C                   BCD                                                TREA821
      BDCIF(M) = BCIF                                                  TREA822
      BDCRL(M) = BCRL                                                  TREA823
      IF (BDIF .LE. 0.0)  GO TO 8500                                   TREA824
      BDRD(M)  = 100.0*(BDIF - BDRL)/BDIF                              TREA825
      GO TO 8600                                                       TREA826
 8500 BDRD(M)  = 0.0                                                   TREA827
C                   SUSP. SOLIDS                                       TREA828
 8600 SSCIF(M) = SCIF                                                  TREA829
      SSCRL(M) = SCRL                                                  TREA830
      IF (SSIF .LE. 0.0)  GO TO 8700                                   TREA831
      SSRD(M)  = 100.0*(SSIF - SSRL)/SSIF                              TREA832
      GO TO 8800                                                       TREA833
 8700 SSRD(M)  = 0.0                                                   TREA834
C                   COLIFORMS                                          TREA835
 8800 COCIF(M) = CCIF                                                  TREA836
      COCRL(M) = CCRL                                                  TREA837
      IF (COIF .LE. 0.0)  GO TO 8900                                   TREA838
      CORD(M) = 100.0*(COIF-CORL)/COIF                                 TREA839
      GO TO 8999                                                       TREA840
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 8900   CORD(M) = 0.0                                                    TREA841
 8999 IF (M .LT. 11)  M = M + 1                                         TREA842
C                                                                       TREA843
C------------        PRINT SOLUTION FOR THIS TIME-STEP        ---------- TREA844
C                                                                       TREA845
 9000 IF (IPRINT .EQ. 0)  GO TO 9500                                    TREA846
      GO TO (9100,9200),IPRINT                                          TREA847
C                                                                       TREA848
C                    A)  ON A QUANTITY BASIS (IPRINT = 1)               TREA849
C                                                                       TREA850
 9100 WRITE(6,691)  KHOUR,KMIN,WAIF,BDIF,SSIF,                         TREA851
     *              COIF,WAOU(3),BDOU(3),SSOU(3),                      TREA852
     *              WAOU(4),BDOU(4),SSOU(4),                           TREA853
     *              WAOU(7),BDOU(7),COOU,                              TREA854
     *              WARL,BDRL,SSRL,CORL,                               TREA855
     *              WAOF,BDOF,SSOF,COOF,                               TREA856
     *              WARM(3),BDRM(3),SSRM(3),                           TREA857
     *              WARM(4),BDRM(4),SSRM(4),                           TREA858
     *              WARM(7),BDRM(7),CORM                               TREA859
  691 FORMAT('0', I2, ':', I2, ' ARR', F7.0, 2F6.1, E10.2, ' OUT',      TREA860
     *       2(F7.0, 2F6.1), F7.0, F6.1, E10.2, F7.0, 2F6.1, E10.2, /,  TREA861
     *       ' ', 5X,' OVF', F7.0, 2F6.1, E10.2, ' REM', 2(F7.0, 2F6.1),TREA862
     *       F7.0, F6.1, E10.2)                                         TREA863
      GO TO 9500                                                        TREA864
C                                                                       TREA865
C                    B)  ON A CONCENTRATION BASIS (IPRINT = 2)          TREA866
C                                                                       TREA867
 9200 WRITE(6,692)  KHOUR,KMIN,QQIF,BCIF,SCIF,CCIF,                    TREA868
     *              QCOU(3),BCOU(3),SCOU(3),                           TREA869
     *              QQOU(4),BCOU(4),SCOU(4),                           TREA870
     *              QQOU(7),BCOU(7),CCOU,                              TREA871
     *              QQRL,BCRL,SCRL,CCRL,                               TREA872
     *              QQOF,BCOF,SCOF,CCOF,                               TREA873
     *              QQRM(3),BCRM(3),SCRM(3),                           TREA874
     *              QQRM(4),BCRM(4),SCRM(4),                           TREA875
     *              QQRM(7),BCRM(7)                                    TREA876
  692 FORMAT('0', I2, ':', I2, ' ARR', F7.2, 2F6.0, E10.2, ' OUT',      TREA877
     *       2(F7.2, 2F6.0), F7.2, F6.0, E10.2, F7.2, 2F6.0, E10.2, /,  TREA878
     *       ' ', 5X,' OVF', F7.2, 2F6.0, E10.2, ' REM', 2(F7.2, 2F6.0),TREA879
     *       F7.2, F6.0)                                                TREA880
 9500 CONTINUE                                                          TREA881
       IA=0                                                             TREA882
      IF (KDT .LT. NDT) GO TO 9999                                      TREA883
C                                                                       TREA884
C ------------          SUMMARIZE                                       TREA885
C                                                                       TREA886
      IF (KNTOF .LT.1)  KNTOF = 10**12                                  TREA887
        WAIFT  = WAIFT*7.48/1000000.0                                   TREA888
        WAOFT  = WAOFT*7.48/1000000.0                                   TREA889
        WARMTT = 0.0                                                    TREA890
        BDRMTT = 0.0                                                    TREA891
        SSRMTT = 0.0                                                    TREA892
      DO 9600  L=1,7                                                    TREA893
        WAINT(L) = WAINT(L)*7.48/1000000.0                              TREA894
        WARMT(L) = WARMT(L)*7.48/1000000.0                              TREA895
        WARMTT = WARMTT + WARMT(L)                                      TREA896
        BDRMTT = BDRMTT + BDRMT(L)                                      TREA897
 9600   SSRMTT = SSRMTT + SSRMT(L)                                      TREA898
        WARLT  = WARLT*7.48/1000000.0                                   TREA899
        WTRMT1 = WARMT(1)*1000000.0/7.48                                TREA900
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      WTRMT5 = WARMT(5)*1000000.0/7.48                                  TREA901
      WAIFRF = 100.0*WARMTT/WAIFT                                       TREA902
      BDIFRF = 100.0*BDRMTT/BDIFT                                       TREA903
      SSIFRF = 100.0*SSRMTT/SSIFT                                       TREA904
      COIFRF = 100.0*CORMT/COIFT                                        TREA905
      WAINRF = 100.0*WARMTT/WAINT(1)                                    TREA906
      BDINRF = 100.0*BDRMTT/BDINT(1)                                    TREA907
      SSINRF = 100.0*SSRMTT/SSINT(1)                                    TREA908
      COINRF = 100.0*CORMT/COINT                                        TREA909
      CL2UTT = 0.0                                                      TREA910
      CHEMTT = 0.0                                                      TREA911
     DO 9700  L=1,8                                                     TREA912
      CL2UTT = CL2UTT + CL2UT(L)                                        TREA913
9700  CHEMTT = CHEMTT + CHEMUT(L)                                       TREA914
     WRITE(6,697)  WAIFT,BDIFT,SSIFT,COIFT,WAOFT,BDOFT,SSOFT,COOFT,     TREA915
    *              WAINT(1),BDINT(1),SSINT(1),COINT,                   TREA916
    *              WARMTT,BDRMTT,SSRMTT,CORMT,WARLT,BDRLT,SSRLT,CORLT, TREA917
    *              WARMT(1),BDRMT(1),SSRMT(1),(NAME(I,J1), I=1,4),     TREA918
    *              WARMT(3),BDRMT(3),SSRMT(3),(NAME(I,J3), I=1,4)      TREA919
 697 FORMAT('1SUMMARY OF TREATMENT EFFECTIVENESS', //,                  TREA920
    *       '0', 20X, 'TOTALS', 15X,                                    TREA921
    *            'FLOW (M.G.)     BOD (LB)     SS (LB) COLIF (MPN)', /,TREA922
    *       ' ', 22X, 'INPUT', 15X, F10.3, 2F12.1, 1PE12.2, /,          TREA923
    *       ' ', 22X, 'OVERFLOW (BYPASS)   ',0PF10.3,2F12.1,1PE12.2, /,TREA924
    *       ' ', 22X, 'TREATED', 13X, 0PF10.3, 2F12.1, 1PE12.2, /,      TREA925
    *       ' ', 22X, 'REMOVED', 13X, 0PF10.3, 2F12.1, 1PE12.2, /,      TREA926
    *       ' ', 22X, 'RELEASED',12X, 0PF10.3, 2F12.1, 1PE12.2, //,     TREA927
    *       'C', 20X, 'REMOVALS', 14X,                                  TREA928
    *                 'FLOW(M.G.)     BOD (LB)     SS (LB)', /,       TREA929
    *       ' ', 22X, 'LEVEL 1', 11X, 0PF12.3, 2F12.1, 18X, '= ',4A4,/,TREA930
    *       ' ', 22X, 'LEVEL 3 (TOTAL)   ', F12.3, 2F12.1,18X,'= ',4A4)TREA931
     IF (ITREAT(3) .NE. 33)  GO TO 9800                                 TREA932
       WARST = WARST*7.48/1000000.0                                     TREA933
     WRITE(6,695)  WARST, BDRST, SSRST                                  TREA934
 695 FORMAT(' ', 22X, 'FINE SCREENS (33) (',F11.3,2('+(', F10.1), ')' ,TREA935
    *           17X, '= ( FINE SCREENS )' )                             TREA936
9800 WRITE(6,696)  WARMT(4),BDRMT(4),SSRMT(4),(NAME(I,J4), I=1,4),      TREA937
    *              WARMT(5),BDRMT(5),SSRMT(5),(NAME(I,J5), I=1,4),      TREA938
    *              WARMT(7),BDRMT(7),SSRMT(7),(NAME(I,J7), I=1,4),      TREA939
    *              WTRMT1,WTRMT5,                                       TREA940
    *              WAIFRF,BDIFRF,SSIFRF,COIFRF,WAINRF,BDINRF,SSINRF,    TREA941
    *              COINRF,CL2UT(3),CHEMUT(3),(NAME(I,J3), I=1,4),       TREA942
    *              CL2UT(4),CHEMUT(4),(NAME(I,J4), I=1,4),              TREA943
    *              CL2UT(7),CHEMUT(7),(NAME(I,J7), I=1,4),              TREA944
    *              CL2UTT,CHEMTT                                        TREA945
 696 FORMAT(' ', 22X, 'LEVEL 4', 11X, F12.3, 2F12.1, 18X, '= ', 4A4, /,TREA946
    *       ' ', 22X, 'LEVEL 5', 11X, F12.3, 2F12.1, 18X, '= ', 4A4, /,TREA947
    *       ' ', 22X, 'LEVEL 7', 11X, F12.3, 2F12.1, 18X, '= ', 4A4, /,TREA948
    *       ' ', 24X, 'TRASH:', /,                                      TREA949
    *       ' ', 22X, 'BAR RACKS', 9X, F12.3,                           TREA950
    *                 ' CU.FT (AT 50 LB/CU.FT.)', /,                    TREA951
    *       ' ', 22X, 'EFFLUENT SCREENS', 2X, F12.3,                    TREA952
    *                 ' CU.FT (AT 50 LB/CU.FT.)', //,                   TREA953
    *       '0', 20X, 'REMOVAL PERCENTAGES', 2X,                        TREA954
    *       ' FLOW (VOL)    BOD (LB)     SS (LB) COLIF (MPN)',  /,     TREA955
    *       ' ', 22X, 'OF OVERALL INPUTS', 1X, 4F12.2, /,               TREA956
    *       ' ', 22X, 'OF TREATED FRACTIONS', F10.2, 3F12.2, //,        TREA957
    *       '0', 20X, 'CONSUMPTIONS (LB)', 7X, 'CHLORINE', 4X,          TREA958
    *       'POLYMERS', /,                                              TREA959
    *       ' ', 22X, 'LEVEL 3', 13X, F10.1, F12.1, 30X, '= ', 4A4, /, TREA960
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     *       ' ', 22X, 'LEVEL 4', 13X, F10.1, F12.1, 30X, '= ', 4A4, /,  TREA961
     *       ' ', 22X, 'LEVEL 7', 13X, F10.1, F12.1, 30X, '= ', 4A4, /,  TREA962
     *       ' ', 22X, 'TOTAL',    15X, F10.1, F12.1)                    TREA963
      WRITE(6,693)  (MHOUR(M),MMIN(M), M=1,11), (QAV(M), M=1,11),        TREA964
     *              (BDCIF(M), M=1,11),                                  TREA965
     *              (BDCRL(M), M=1,11), (BDRD(M), M=1,11),               TREA966
     *              (SSCIF(M), M=1,11), (SSCRL(M), M=1,11),              TREA967
     *              (SSRD(M), M=1,11), (COCIF(M), M=1,11),               TREA968
     *              (COCRL(M), M=1,11), (CORD(M), M=1,11)                TREA969
  693 FORMAT('0', 15X, 'REPRESENTATIVE VARIATION OF TREATMENT PERFORM',   TREA970
     *       'ANCE WITH TIME (OVERALL).', /,                             TREA971
     *       '0', 11X, 'TIME', 15X, 11(4X, I2, ':', I2), /,              TREA972
     *       ' ', 11X, 'WATER', /,                                       TREA973
     *       ' ', 14X, 'AV. FLOW (CFS)  ', 11F9.2, /,                    TREA974
     *       ' ', 11X, 'BOD', /,                                         TREA975
     *       ' ', 14X, 'ARRIVING (MG/L) ', 11F9.2, /,                    TREA976
     *       ' ', 14X, 'RELEASED (MG/L) ', 11F9.2, /,                    TREA977
     *       ' ', 14X, '% REDUCTION (LB)', 11F9.2, /,                    TREA978
     *       ' ', 11X, 'S. SOLIDS ', /,                                  TREA979
     *       ' ', 14X, 'ARRIVING (MG/L) ', 11F9.2, /,                    TREA980
     *       ' ', 14X, 'RELEASED (MG/L) ', 11F9.2, /,                    TREA981
     *       ' ', 14X, '% REDUCTION (LB)', 11F9.2, /,                    TREA982
     *       ' ', 11X, 'COLIFORMS ', /,                                  TREA983
     *       ' ', 14X, 'ARR (MPN/100ML) ', 1P11E9.2, /,                  TREA984
     *       ' ', 14X, 'REL (MPN/100ML) ',   11E9.2, /.                  TREA985
     *       ' ', 14X, '% REDUCTION (LB)', 0P11F9.2)                     TREA986
      IF (IRANGE .EQ. 0)  GO TO 9999                                     TREA987
        QQIFMX = QQIFMX/1.547                                            TREA988
        QQOFMX = QQOFMX/1.547                                            TREA989
        QQINMX = QQINMX/1.547                                            TREA990
        QQRLMX = QQRLMX/1.547                                            TREA991
        QQIFT  = QQIFT/(1.547*NDT)                                       TREA992
        QQOFT  = QQOFT/(1.547*KNTOF)                                     TREA993
        QQINT  = QQINT/(1.547*NDT)                                       TREA994
        QQRLT  = QQRLT/(1.547*NDT)                                       TREA995
        QQIFMN = QQIFMN/1.547                                            TREA996
        QQOFMN = QQOFMN/1.547                                            TREA997
        QQINMN = QQINMN/1.547                                            TREA998
        QQRLMN = QQRLMN/1.547                                            TREA999
        QQRMMX(3) = QQRMMX(3)/1.547                                      TREA001
        QQRMMX(4) = QQRMMX(4)/1.547                                      TREA002
        QQRMMX(7) = QQRMMX(7)/1.547                                      TREA003
        QQOUMX(3) = QQOUMX(3)/1.547                                      TREA004
        QQOUMX(4) = QQOUMX(4)/1.547                                      TREA005
        QQOUMX(7) = QQOUMX(7)/1.547                                      TREA006
        QQRMT(3)  = QQRMT(3)/(1.547*NDT)                                 TREA007
        QQRMT(4)  = QQRMT(4)/(1.547*NDT)                                 TREA008
        QQRMT(7)  = QQRMT(7)/(1.547*NDT)                                 TREA009
        QQOUT(3)  = QQOUT(3)/(1.547*NDT)                                 TREA010
        QQOUT(4)  = QQOUT(4)/(1.547*NDT)                                 TREA011
        QQOUT(7)  = QQOUT(7)/(1.547*NDT)                                 TREA012
        QQRMMN(3) = QQRMMN(3)/1.547                                      TREA013
        QQRMMN(4) = QQRMMN(4)/1.547                                      TREA014
        QQRMMN(7) = QQRMMN(7)/1.547                                      TREA015
        QQOUMN(3) = QQOUMN(3)/1.547                                      TREA016
        QQOUMN(4) = QQOUMN(4)/1.547                                      TREA017
        QQOUMN(7) = QQOUMN(7)/1.547                                      TREA018
C                                                                        TREA019
        BCIFT = BCIFT/NDT                                                TREA020
        BCOFT = BCOFT/KNTOF                                              TREA021
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      BCINT = BCINT/NDT                                                 TREA022
      BCRLT = BCRLT/NDT                                                 TREA023
      SCIFT = SCIFT/NDT                                                 TREA024
      SCOFT = SCOFT/KNTOF                                               TREA025
      SCINT = SCINT/NDT                                                 TREA026
      SCRLT = SCRLT/NDT                                                 TREA027
      CCIFT = CCIFT/NDT                                                 TREA028
      CCOFT = CCOFT/KNTOF                                               TREA029
      CCINT = CCINT/NDT                                                 TREA030
      CCRLT = CCRLT/NDT                                                 TREA031
      BCRMT(3) = BCRMT(3)/NDT                                           TREA032
      BCRMT(4) = BCRMT(4)/NDT                                           TREA033
      BCRMT(7) = BCRMT(7)/NDT                                           TREA034
      SCRMT(3) = SCRMT(3)/NDT                                           TREA035
      SCRMT(4) = SCRMT(4)/NDT                                           TREA036
      SCRMT(7) = SCRMT(7)/NDT                                           TREA037
      BCOUT(3) = BCOUT(3)/NDT                                           TREA038
      BCOUT(4) = BCOUT(4)/NDT                                           TREA039
      BCOUT(7) = BCOUT(7)/NDT                                           TREA040
      SCOUT(3) = SCOUT(3)/NDT                                           TREA041
      SCOUT(4) = SCOUT(4)/NDT                                           TREA042
      SCOUT(7) = SCOUT(7)/NDT                                           TREA043
     CCOUT    = CCOUT/NDT                                               TREA044
C                                                                       TREA045
      WRITE(6,698)  QQIFMX,QQOFMX,QQINMX,QQRMMX(3),QQOUMX(3),QQRMMX(4), TREA046
     *              QQOUMX(4),QQRMMX(7),QQOUMX(7),QQRLMX,               TREA047
     *              QQIFT,QQOFT,QQINT,QQRMT(3),QQOUT(3),QQRMT(4),       TREA048
     *              QQOUT(4),QQRMT(7),QQOUT(7),QQRLT,                   TREA049
     *              QQIFMN,QQOFMN,QQINMN,QQRMMN(3),QQOUMN(3),QQRMMN(4), TREA050
     *              QQOUMN(4),QQRMMN(7),QQOUMN(7),QQRLMN,               TREA051
     *              BCIFMX,BCOFMX,BCINMX,BCRMMX(3),BCOUMX(3),BCRMMX(4), TREA052
     *              BCOUMX(4),BCRMMX(7),BCOUMX(7),BCRLMX,               TREA053
     *              BCIFT,BCOFT,BCINT,BCRMT(3),BCOUT(3),BCRMT(4),       TREA054
     *              BCOUT(4),BCRMT(7),BCOUT(7),BCRLT,                   TREA055
     *              BCIFMN,BCOFMN,BCINMN,BCRMMN(3),BCOUMN(3),BCRMMN(4), TREA056
     *              BCOUMN(4),BCRMMN(7),BCOUMN(7),BCRLMN                TREA057
      WRITE(6,694)  SCIFMX,SCOFMX,SCINMX,SCRMMX(3),SCOUMX(3),SCRMMX(4), TREA058
     *              SCOUMX(4),SCRMMX(7),SCOUMX(7),SCRLMX,               TREA059
     *              SCIFT,SCOFT,SCINT,SCRMT(3),SCOUT(3),SCRMT(4),       TREA060
     *              SCOUT(4),SCRMT(7),SCOUT(7),SCRLT,                   TREA061
     *              SCIFMN,SCOFMN,SCINMN,SCRMMN(3),SCOUMN(3),SCRMMN(4), TREA062
     *              SCOUMN(4),SCRMMN(7),SCOUMN(7),SCRLMN,               TREA063
     *              CCIFMX,CCOFMX,CCINMX,CCOUMX,CCRLMX,                 TREA064
     *              CCIFT,CCOFT,CCINT,CCOUT,CCRLT                       TREA065
      IF (CCOFMN .LE. 0.0)  WRITE(6,688)  CCIFMN,CCOFMN,CCINMN,CCOUMN,  TREA066
     *                                    CCRLMN                        TREA067
  688 FORMAT(' MINIMUM  ', 1PE12.2, 0PE12.2, 1PE12.2, 60X, 2E12.2)      TREA068
      IF (CCOFMN .GT. 0.0)  WRITE(6,689)  CCIFMN,CCOFMN,CCINMN,CCOUMN,  TREA069
     *                                    CCRLMN                        TREA070
  689 FORMAT(' MINIMUM  ',   3E12.2, 60X, 2E12.2)                       TREA071
  698 FORMAT('1', 15X, 'SUMMARY OF FLOWS - MAXIMA, AVERAGES, AND ',     TREA072
     *       'MINIMA', //,                                              TREA073
     *       '0', 39X, 'TO',15X, 'LEVEL 3',17X, 'LEVEL 4',17X,'LEVEL 7',TREA074
     *       8X, 'RECOMBINED', /,                                       TREA075
     *       ' ', 13X, 'ARRIVING    OVERFLOW   TREATMENT     REMOVAL',  TREA076
     *       5X, 'OUTFLOW     REMOVAL     OUTFLOW     REMOVAL',         TREA077
     *       5X, 'OUTFLOW     RELEASE', //,                              TREA078
     *       '0',  5X, 'FLOW RATES (M.G.D.)', /,                        TREA079
     *       'MAXIMUM  ', 10F12.3, /,                                   TREA080
     *       ' AVERAGE  ', 10F12.3, /,                                  TREA081
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     *       ' MINIMUM  ', 10F12.3, ///,                                    TREA082
     *       'C',  5X, 'BOD CONCENTRATIONS (MG/L)', /,                      TREA083
     *       'OMAXIMUM  ', 10F12.1, /,                                      TREA084
     *       ' AVERAGE  ', 10F12.1, /,                                      TREA085
     *       ' MINIMUM  ', 10F12.1, //)                                     TREA086
  694 FORMAT('C',  5X, 'SUSPENDED SOLIDS CONCENTRATIONS (MG/L)', /,         TREA087
     *       'OMAXIMUM  ', 10F12.1, /,                                      TREA088
     *       ' AVERAGE  ', 10F12.1, /,                                      TREA089
     *       ' MINIMUM  ', 10F12.1, ///,                                    TREA090
     *       'O', 5X, 'COLIFORM CONCENTRATIONS (MPN/100ML)', /,             TREA091
     *       'OMAXIMUM  ', 1P3E12.2, 60X, 2E12.2, /,                        TREA092
     *       ' AVERAGE  ',   3E12.2, 60X, 2E12.2)                           TREA093
       QQIFMX = QQIFMX*1.547                                                TREA094
C                                                                           TREA095
 9999 RETURN                                                                TREA096
      END                                                                   TREA097
C=======================================================================TREA098
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      SUBROUTINE BYPASS                                                 BYPA  1
      COMMON  CCNVER,KHCUR,KMIN,L,KPOD,NFLAG,BIG,HEAD1,HEAD2,           BYPA  2
     *  QDESYN,QQIF,WAOU(7),WAIN(7),QQOU(7),QQIN(7),WARM(7),QQRL,       BYPA  3
     *  BDIF,CCRM(7),BDOU(7),BDIN(7),BCOU(7),BCIN(7),BDRL,              BYPA  4
     *  SSIF,SSIN(7),SSOU(7),SCOU(7),SCIN(7),SSRM(7),SSRL,COIF,CURL,    BYPA  5
     *  ADEPTH(11),AASURF(11),ITREAT(7),ISTOR,IPRINT,ICOST,HRFD,        BYPA  6
     *  MODSIZ,ICHEM,ICL2,SCREEN,QQIFMX,DESF,IRANGE,KNTUF,TRIBA,SEDA,   BYPA  7
     *  SQM,SREFFH,BREFFH,NUNITH,UAREAH,OPRAMA,ICHEMH,HM,VOLDAF,ITABLE, BYPA  8
     *  MODCST,TOTCST,RECIRC,OVRDAF,TSURFA,OVRSED,NSED,JM(7),WTRMTS,    BYPA  9
     *  NSCRA,SCRCAP,SUAREA,FAREAB,NMS,AREAMS,VOLCON,VOLSED,ALJMUT,     BYPA 10
     *  BDINT(7),SSINT(7),WAINT(7),BDOUT(7),SSOUT(7),WAOUT(7),          BYPA 11
     *  WARMT(7),BDRMT(7),SSRMT(7),CHEMUT(8),CL2UT(8),QKOD(20),WTPMT1,  BYPA 12
     *  QQRMT(7),QQOUT(7),QQRMMX(7),QQOUMX(7),QQRMMN(7),QQOUMN(7),      BYPA 13
     *  BCRMT(7),BCOUT(7),BCRMMX(7),BCOUMX(7),BCRMMN(7),BCOUMN(7),      BYPA 14
     *  SCRMT(7),SCOUT(7),SCRMMX(7),SCOUMX(7),SCRMMN(7),SCOUMN(7),      BYPA 15
     *  BDRM(7),BCRM(7),SCRM(7)                                         BYPA 16
C                                                                       BYPA 17
        WAOU(L) = WAIN(L)                                               BYPA 18
        QQOU(L) = QQIN(L)                                               BYPA 19
        WARM(L) = 0.0                                                   BYPA 20
        QQRM(L) = 0.0                                                   BYPA 21
        BDOU(L) = BDIN(L)                                               BYPA 22
        BCOU(L) = BCIN(L)                                               BYPA 23
        BDRM(L) = 0.0                                                   BYPA 24
        BCRM(L) = 0.0                                                   BYPA 25
        SSOU(L) = SSIN(L)                                               BYPA 26
        SCOU(L) = SCIN(L)                                               BYPA 27
        SSRM(L) = 0.0                                                   BYPA 28
        SCRM(L) = 0.0                                                   BYPA 29
C                                                                       BYPA 30
 9999 RETURN                                                            BYPA 31
      END                                                               BYPA 32
C=======================================================================BYPA 33
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      SUBROUTINE TRLINK                                                 TRLI  1
      COMMON  CONVER,KHOUR,KMIN,L,KMOD,NFLAG,BIG,HEAD1,HEAD2,           TRLI  2
     *  QDESYN,QQIF,WAOU(7),WAIN(7),QQOU(7),QQIN(7),WARM(7),QQRL,       TRLI  3
     *  BDIF,BCRM(7),BDOU(7),BDIN(7),BCOU(7),BCIN(7),BDRL,              TRLI  4
     *  SSIF,SSIN(7),SSOU(7),SCOU(7),SCIN(7),SSRM(7),SSRL,CUIF,CURL,    TRLI  5
     *  ADEPTH(11),AASURF(11),ITREAT(7),ISTOR,IPRINT,ICOST,HRFD,        TRLI  6
     *  MODSIZ,ICHEM,ICL2,SCREEN,QQIFMX,DESF,IRANGE,KNTOF,TRIBA,SEDA,   TRLI  7
     *  SQM,SREFFH,BREFFH,NUNITH,UAREAH,OPRAMA,ICHEMH,HM,VOLDAF,ITABLE, TRLI  8
     *  MODCST,TOTCST,RECIRC,OVRDAF,TSURFA,OVRSED,NSED,JM(7),WTRMT5,    TRLI  9
     *  NSCRN,SCRCAP,SUAREA,FAREAB,NMS,AREAMS,VOLCON,VOLSED,ALJMUT,     TRLI 10
     *  BDINT(7),SSINT(7),WAINT(7),BDOUT(7),SSOUT(7),WAOUT(7),          TRLI 11
     *  WARMT(7),BDRMT(7),SSRMT(7),CHEMUT(8),CL2UT(8),QMOD(20),WTRMT1,  TRLI 12
     *  QQRMT(7),QQOUT(7),QQRMMX(7),QQOUMX(7),QQRMMN(7),QQOUMN(7),      TRLI 13
     *  BCRMT(7),BCOUT(7),BCRMMX(7),BCOUMX(7),BCRMMN(7),BCOUMN(7),      TRLI 14
     *  SCRMT(7),SCOUT(7),SCRMMX(7),SCOUMX(7),SCRMMN(7),SCOUMN(7),      TRLI 15
     *  BDRM(7),BCRM(7),SCRM(7)                                         TRLI 16
C                                                                       TRLI 17
        BDRMT(L)  = BDRMT(L) + BDRM(L)                                  TRLI 18
        SSRMT(L)  = SSRMT(L) + SSRM(L)                                  TRLI 19
        WARMT(L)  = WARMT(L) + WARM(L)                                  TRLI 20
        BDOUT(L)  = BDOUT(L) + BDOU(L)                                  TRLI 21
        SSOUT(L)  = SSOUT(L) + SSOU(L)                                  TRLI 22
        WAOUT(L)  = WAOUT(L) + WAOU(L)                                  TRLI 23
      IF (IRANGE .EQ. 0)  GO TO 5000                                    TRLI 24
      IF (QQRM(L) .GT. QQRMMX(L))  QQRMMX(L) = QQRM(L)                  TRLI 25
      IF (BCRM(L) .GT. BCRMMX(L))  BCRMMX(L) = BCRM(L)                  TRLI 26
      IF (SCRM(L) .GT. SCRMMX(L))  SCRMMX(L) = SCRM(L)                  TRLI 27
      IF (QQOU(L) .GT. QQOUMX(L))  QQOUMX(L) = QQOU(L)                  TRLI 28
      IF (BCOU(L) .GT. BCOUMX(L))  BCOUMX(L) = BCOU(L)                  TRLI 29
      IF (SCOU(L) .GT. SCOUMX(L))  SCOUMX(L) = SCOU(L)                  TRLI 30
      IF (QQRM(L) .LT. QQRMMN(L))  QQRMMN(L) = QQRM(L)                  TRLI 31
      IF (BCRM(L) .LT. BCRMMN(L))  BCRMMN(L) = BCRM(L)                  TRLI 32
      IF (SCRM(L) .LT. SCRMMN(L))  SCRMMN(L) = SCRM(L)                  TRLI 33
      IF (QQOU(L) .LT. QQOUMN(L))  QQOUMN(L) = QQOU(L)                  TRLI 34
      IF (BCOU(L) .LT. BCOUMN(L))  BCOUMN(L) = BCOU(L)                  TRLI 35
      IF (SCOU(L) .LT. SCOUMN(L))  SCOUMN(L) = SCOU(L)                  TRLI 36
        QQRMT(L) = QQRMT(L) + QQRM(L)                                   TRLI 37
        BCRMT(L) = BCRMT(L) + BCRM(L)                                   TRLI 38
        SCRMT(L) = SCRMT(L) + SCRM(L)                                   TRLI 39
        QQOUT(L) = QQOUT(L) + QQOU(L)                                   TRLI 40
        BCOUT(L) = BCOUT(L) + BCOU(L)                                   TRLI 41
        SCOUT(L) = SCOUT(L) + SCOU(L)                                   TRLI 42
 5000 IF (L .EQ. 7)  GO TO 9999                                         TRLI 43
C                                                                       TRLI 44
        WAIN(L+1) = WAOU(L)                                             TRLI 45
        QQIN(L+1) = QCOU(L)                                             TRLI 46
        BDIN(L+1) = BDOU(L)                                             TRLI 47
        BCIN(L+1) = BCOU(L)                                             TRLI 48
        SSIN(L+1) = SSOU(L)                                             TRLI 49
        SCIN(L+1) = SCOU(L)                                             TRLI 50
C                                                                       TRLI 51
 9999 RETURN                                                            TRLI 52
      END                                                               TRLI 53
C=======================================================================TRLI 54
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```
      SUBROUTINE SEDIP                                                  SEDI   1
      COMMON  CONVER,KHOUR,KMIN,L,KMOD,NFLAG,BIG,HEAD1,HEAD2,           SEDI   2
     *  QDESYN,QQIF,WAOU(7),WAIN(7),QQOU(7),QQIN(7),WARM(7),QQRL,       SEDI   3
     *  BDIF,QCRM(7),BDOU(7),BDIN(7),BCOU(7),BCIN(7),BDRL,              SEDI   4
     *  SSIF,SSIN(7),SSOU(7),SCOU(7),SCIN(7),SSRM(7),SSRL,COIF,CORL,    SEDI   5
     *  ADEPTH(11),AASURF(11),ITREAT(7),ISTOR,IPRINT,ICOST,HRFD,        SEDI   6
     *  MODSIZ,ICHEM,ICL2,SCREEN,QQIFMX,DESF,IRANGE,KNTUF,TRIBA,SEDA,   SEDI   7
     *  SQM,SREFFH,BREFFH,NUNITH,UAREAH,OPRAMA,ICHEMH,HM,VOLDAF,ITABLE, SEDI   8
     *  MODCST,TOTCST,RECIRC,OVRDAF,TSURFA,OVRSED,NSED,JM(7),WTRMT5,    SEDI   9
     *  NSCRN,SCRCAP,SUAREA,FAREAB,NMS,AREAMS,VOLCON,VOLSED,ALUMUT,     SEDI  10
     *  BDINT(7),SSINT(7),WAINT(7),BDOUT(7),SSOUT(7),WAOUT(7),          SEDI  11
     *  WARMT(7),BDRMT(7),SSRMT(7),CHEMUT(8),CL2UT(8),QMOD(20),WTRMT1,  SEDI  12
     *  QQRMT(7),QQOUT(7),QQRMMX(7),QQOUMX(7),QQRMMN(7),QQOUMN(7),      SEDI  13
     *  BCRMT(7),BCOUT(7),BCRMMX(7),BCOUMX(7),BCRMMN(7),BCOUMN(7),      SEDI  14
     *  SCRMT(7),SCOUT(7),SCRMMX(7),SCOUMX(7),SCRMMN(7),SCOUMN(7),      SEDI  15
     *  BDRM(7),BCRM(7),SCRM(7)                                         SEDI  16
      COMMON  /TBLK/DT,NDT,KDT                                          SEDI  17
      COMMON  /STBK/QIN(150),BODIN(150),SUSIN(150),COLIN(150),          SEDI  18
     *  QINST,QOUST,QINSTL,QOUSTL,STORL,QOUTO,STORO,                    SEDI  19
     *  ISPRIN,IPOL,DEPMAX,QCMAX,DEPTH,                                 SEDI  20
     *  ATERM(11),AO2DT2(11),BDEPTH(11),BSTOR(11),                      SEDI  21
     *  DUMSTR(11),DUMDEP(11),                                          SEDI  22
     *  VOLIN(150),VOLOUT(150),STOR,CUMIN,CUMOUT,                       SEDI  23
     *  SBOD,SSS,SCOL,BODOUT,SUSOUT,COLOUT,                             SEDI  24
     *  ISTMOD,ISTTYP,ISTOUT,                                           SEDI  25
     *  QPUMP,DSTART,DSTOP,                                             SEDI  26
     *  DTON,STORMX,DTPUMP,DTMORE,STORF,APLAN,                          SEDI  27
     *  CLAND,CSTOR,CPS,CTOTAL,CPCUYD,CPACRE,                           SEDI  28
     *  LP,JP,LPREV,LABEL,DETENT(150),FRAC(150)                         SEDI  29
C                                                                       SEDI  30
      GO TO (3600,3700), ISTOR                                          SEDI  31
C                   SED TANKS TO BE INSTALLED (NO ASSOCIATED STORAGE)   SEDI  32
 3600   AREA   = SEDA*NSED                                              SEDI  33
      GO TO 3800                                                        SEDI  34
C                   SEDIMENTATION IN ASSOCIATED STORAGE UNIT            SEDI  35
C                                                                       SEDI  36
 3700 CALL INTERP(ADEPTH,AASURF,11,DEPTH,AREA,KFLAG)                    SEDI  37
C                                                                       SEDI  38
      IF (KFLAG .EQ. -10)  GO TO 901                                    SEDI  39
      IF (KFLAG .EQ.  10)  GO TO 902                                    SEDI  40
C       VOLSED = ??                                                     SEDI  41
C                                                                       SEDI  42
 3800   OVFRA  = QQIN(3)*646000.0/AREA                                  SEDI  43
      IF (OVFRA .LE. 300.0)  OVFRA = 300.0                              SEDI  44
        SREFF  = 0.656 + 0.06*SCIN(3)/190.0 - 0.4*(OVFRA-300.0)/2000.0  SEDI  45
      IF (SREFF .GE. 0.76)  SREFF = 0.76                                SEDI  46
      IF (SREFF .LE. 0.30)  SREFF = 0.30                                SEDI  47
        FACTOR = 0.646*8.35*DT/1440.0                                   SEDI  48
        SSRM(3) = SREFF*SCIN(3)*QQIN(3)*FACTOR                          SEDI  49
        BREFF   = 0.55*SREFF                                            SEDI  50
      IF (ICL2 .NE. 1)  GO TO 3805                                      SEDI  51
        BREFF = BREFF*1.15                                              SEDI  52
C?    CALL KILL(VOLSED,SCIF,SCIN(3),QQIN(3),CCIN,CCOU)                  SEDI  53
CC                  SOME OF ABOVE ARGUMENTS ARE NEEDED IN COMMON        SEDI  54
 3805   BDRM(3) = BREFF*BCIN(3)*QQIN(3)*FACTOR                          SEDI  55
        SSOU(3) = SSIN(3) - SSRM(3)                                     SEDI  56
        BDOU(3) = BDIN(3) - BDRM(3)                                     SEDI  57
        QQRM(3) = SSRM(3)*20.0/(8.35*DT*449.0)                          SEDI  58
      GO TO (3810,3820), ISTOR                                          SEDI  59
 3810 IF (QQRM(3) .LT. 0.1)  QQRM(3) = 0.1                              SEDI  60
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```
        WARM(3) = QQRM(3)*DT*60.0                                       SEDI 61
        WAOU(3) = WAIN(3) - WARM(3)                                     SEDI 62
        QQOU(3) = QQIN(3) - QQRM(3)                                     SEDI 63
      GO TO 3850                                                        SEDI 64
 3820 IF (QQRM(3) .LT. 0.1 .AND. DEPTH .NE. 0.0)  QQRM(3) = 0.1         SEDI 65
      IF (DEPTH .EQ. 0.0)  QQRM(3) = 0.0                                SEDI 66
        WARM(3) = QQRM(3)*DT*60.0                                       SEDI 67
        WAOU(3) = WAIN(3) - WARM(3)                                     SEDI 68
        QQOU(3) = QQIN(3) - QQRM(3)                                     SEDI 69
      IF (WAOU(3) .LT. 0.0)  WAOU(3) = 0.0                              SEDI 70
      IF (QQOU(3) .LT. 0.0)  QQOU(3) = 0.0                              SEDI 71
C                    MASS BALANCE INEXACT IN THIS CASE                  SEDI 72
 3850   SCRM(3) = SSRM(3)/(QQRM(3)*FACTOR)                              SEDI 73
        BCRM(3) = BDRM(3)/(QQRM(3)*FACTOR)                              SEDI 74
        SCOU(3) = SSOU(3)/(QQOU(3)*FACTOR)                              SEDI 75
        BCOU(3) = BDOU(3)/(QQOU(3)*FACTOR)                              SEDI 76
C?      CL2LT   =                                                       SEDI 77
      GO TO 9999                                                        SEDI 78
C                                                                       SEDI 79
C------------------ ERROR MESSAGES ---------------------------------------SEDI 80
C                                                                       SEDI 81
  901 WRITE(6,691)                                                      SEDI 82
  691 FORMAT('0 *** TERMINATE - INPUT TO INTERP PROCEDURE IS LESS THAN LSEDI 83
     *OWEST VALUE ON CURVE (IN SUBRT. SEDIM)')                          SEDI 84
      STOP                                                              SEDI 85
C                                                                       SEDI 86
  902 WRITE(6,692)                                                      SEDI 87
  692 FORMAT('0 *** TERMINATE - INPUT TO INTERP PROCEDURE IS GREATER THASEDI 88
     *N LARGEST VALUE ON CURVE (IN SUBRT. SEDIM)')                      SEDI 89
      STOP                                                              SEDI 90
C                                                                       SEDI 91
C                                                                       SEDI 92
 9999 RETURN                                                            SEDI 93
      END                                                               SEDI 94
C=======================================================================SEDI 95
```

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      SUBROUTINE HIGHRF                                                  HIGH  1
      COMMON  CONVER,KHCUR,KMIN,L,KMOD,NFLAG,BIG,HEAD1,HEAD2,            HIGH  2
     *  QDESYN,QQIF,WAQU(7),WAIN(7),QQOU(7),QQIN(7),WARM(7),QQRL,        HIGH  3
     *  BDIF,CORM(7),BDOU(7),BDIN(7),BCOU(7),BCIN(7),BDRL,               HIGH  4
     *  SSIF,SSIN(7),SSOU(7),SCOU(7),SCIN(7),SSRM(7),SSRL,COIF,CORL,     HIGH  5
     *  ADEPTH(11),AASURF(11),ITREAT(7),ISTOR,IPRINT,ICOST,HRFD,         HIGH  6
     *  MODSIZ,ICHEM,ICL2,SCREEN,QQIFMX,DESF,IRANGE,KNTOF,TRIBA,SEDA,    HIGH  7
     *  SQM,SREFFH,BREFFH,NUNITH,UAREAH,OPRAMA,ICHEMH,HM,VOLDAF,ITABLE,  HIGH  8
     *  MODCST,TOTCST,RECIRC,OVRDAF,TSURFA,OVRSED,NSED,JM(7),WTRMT5,     HIGH  9
     *  NSCRN,SCRCAP,SUAREA,FAREAB,AMS,AREAMS,VOLCON,VOLSED,ALUMUT,      HIGH 10
     *  BDINT(7),SSINT(7),WAINT(7),BDOUT(7),SSOUT(7),WAOUT(7),           HIGH 11
     *  WARMT(7),BCRMT(7),SSRMT(7),CHEMUT(8),CL2UT(8),QMOD(20),WTRMT1,   HIGH 12
     *  QQRMT(7),QQOUT(7),QQRMMX(7),QQOUMX(7),QQRMMN(7),QQOUMN(7),       HIGH 13
     *  BCRMT(7),BCOUT(7),BCRMMX(7),BCOUMX(7),BCRMMN(7),BCOUMN(7),       HIGH 14
     *  SCRMT(7),SCOUT(7),SCRMMX(7),SCOUMX(7),SCRMMN(7),SCOUMN(7),       HIGH 15
     *  BDRM(7),BCRM(7),SCRM(7)                                          HIGH 16
      COMMON  /TBLK/DT,NDT,KDT                                           HIGH 17
C                                                                        HIGH 18
CC                  ACCORDING TO AJB, THIS SUBROUTINE                  HIGH 19
CC                  IS ONLY VALID FOR DT = 10 MIN.                     HIGH 20
CC                  FIX UP FOR TIME GIVEN IN SUBRT. TRCHEK             HIGH 21
CC                                                                     HIGH 22
      IF (KDT .GT. 1)  GO TO 4300                                        HIGH 23
      ASSIGN 4310 TO LABEL                                               HIGH 24
        NDTBH  = HRFD*NUNITH - 1.0                                       HIGH 25
        SBOD   = 0.0                                                     HIGH 26
        S      = 0.0                                                     HIGH 27
C                   S      = SOLIDS HELD IN FILTER (LB/SQ.FT)            HIGH 28
C                                                                        HIGH 29
 4300 GO TO LABEL,(4310,4320,4330,4340,4350)                             HIGH 30
C                   INITIALLY, BEFORE ANY BACKWASH IS NECESSARY          HIGH 31
 4310   FACTOR  = S*20.0/SQM                                             HIGH 32
      IF (FACTOR .GT. 1.0)  FACTOR = 1.0                                 HIGH 33
        SREFF   = 0.5*SREFFH*(1.0 + FACTOR)                              HIGH 34
        BREFF   = 0.5*BREFFH*(1.0 + FACTOR)                              HIGH 35
C                                                                        HIGH 36
        SCOU(4) = SCIN(4)*(1.0 - SREFF)                                  HIGH 37
        BCOU(4) = BCIN(4)*(1.0 - BREFF)                                  HIGH 38
        QQOU(4) = QQIN(4)                                                HIGH 39
        OPRA    = 449.0*QQIN(4)/(NUNITH*UAREAH)                          HIGH 40
        DS      = SCIN(4)*SREFF*(OPRA/695.0)*8.35*(DT/1440.0)            HIGH 41
        S       = S + DS                                                 HIGH 42
        HO      = ((OPRA/OPRAMA)**1.18)*0.40*HM                          HIGH 43
        HCL     = (OPRA/OPRAMA)*(S/SQM)*0.60*HM                          HIGH 44
        H       = HO + HCL                                               HIGH 45
C                                                                        HIGH 46
        H1      = HM*0.90*(NUNITH - 1)/NUNITH                            HIGH 47
      IF (H .GE. H1)  ASSIGN 4320 TO LABEL                               HIGH 48
        QQRM(4) = 0.0                                                    HIGH 49
        BCRM(4) = BIG                                                    HIGH 50
        SCRM(4) = BIG                                                    HIGH 51
      GO TO 4390                                                         HIGH 52
C                   FIRST TIMESTEP OF BACKWASH                           HIGH 53
 4320   KDTBH   = 0                                                      HIGH 54
      ASSIGN 4330 TO LABEL                                               HIGH 55
        S1      = 0.0                                                    HIGH 56
        OPRA    = 449.0*QQIN(4)/(UAREAH*(NUNITH-1))                      HIGH 57
        DS      = SCIN(4)*SREFF*(OPRA/695.0)*8.35*(DT/1440.0)            HIGH 58
        S       = S + DS                                                 HIGH 59
        SCOU(4) = SCIN(4)*(1.0 - SREFF)                                  HIGH 60
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        BCOU(4) = BCIN(4)*(1.0 - BREFF)                                  HIGH 61
 4325   QQRM(4) = (UAREAH*15.0)/449.0                                    HIGH 62
        QQOU(4) = QQIN(4) - QQRM(4)                                      HIGH 63
        SCRM(4) = UAREAH*S*1440.0/(10.0*QQRM(4)*0.646*8.35)              HIGH 64
        DBOD    = BCIN(4)*BREFF*(QPRA/659.0)*8.35*(10.0/1440.0)          HIGH 65
        SBOD    = SBOD + DBOD                                            HIGH 66
        BCRM(4) = UAREAH*SBOD*1440.0/(10.0*QQRM(4)*0.646*8.35)           HIGH 67
      GO TO 4350                                                         HIGH 68
C                     SUBSEQUENT TIMESTEPS OF BACKWASH                   HIGH 69
 4330   KDTBW   = KDTBW + 1                                             HIGH 70
      IF (KDTBW .GE. NDTBW)  ASSIGN 4340 TO LABEL                        HIGH 71
        SREFF2  = (0.5 + NUNITH - 1.0)*SREFF/NUNITH                      HIGH 72
        BREFF2  = (0.5 + NUNITH - 1.0)*BREFF/NUNITH                      HIGH 73
        SCOU(4) = SCIN(4)*(1.0 - SREFF2)                                 HIGH 74
        BCOU(4) = BCIN(4)*(1.0 - BREFF2)                                 HIGH 75
        DS      = SCIN(4)*SREFF*(QPRA/695.0)*8.35*(10.0/1440.0)          HIGH 76
        S       = S + DS                                                 HIGH 77
        FACTR1  = S1*20.0/SQM                                            HIGH 78
      IF (FACTR1 .GE. 1.0)  FACTR1 = 1.0                                 HIGH 79
        SREFF1  = 0.5*SREFF*(1.0 + FACTR1)                               HIGH 80
        DS1     = SCIN(4)*SREFF1*(QPRA/695.0)*8.35*(10.0/1440.0)         HIGH 81
        S1      = S1 + DS1                                               HIGH 82
      GO TO 4325                                                         HIGH 83
C                   FIRST TIMESTEP AFTER BACKWASH COMPLETED              HIGH 84
 4340 ASSIGN 4350 TO LABEL                                               HIGH 85
        SREFF2  = (0.5 + NUNITH - 1.0)*SREFF/NUNITH                      HIGH 86
        BREFF2  = (0.5 + NUNITH - 1.0)*BREFF/NUNITH                      HIGH 87
        SCOU(4) = SCIN(4)*(1.0 - SREFF2)                                 HIGH 88
        BCOU(4) = BCIN(4)*(1.0 - BREFF2)                                 HIGH 89
        QQRM(4) = 0.0                                                    HIGH 90
        QQOU(4) = QQIN(4)                                                HIGH 91
        DS1     = SCIN(4)*SREFF1*(QPRA/695.0)*8.35*(10.0/1440.0)         HIGH 92
        S1      = S1 + DS1                                               HIGH 93
        SCRM(4) = BIG                                                    HIGH 94
        BCRM(4) = BIG                                                    HIGH 95
      GO TO 4390                                                         HIGH 96
C                   SUBSEQUENT TIMESTEPS AFTER BACKWASH COMPLETION       HIGH 97
 4350   FACTCR  = 1.0                                                    HIGH 98
        SREFF   = 0.5*SREFFH*(1.0 + FACTOR)                              HIGH 99
        BREFF   = 0.5*BREFFH*(1.0 + FACTOR)                              HIGH100
        SCOU(4) = SCIN(4)*(1.0 - SREFF)                                  HIGH101
        BCOU(4) = BCIN(4)*(1.0 - BREFF)                                  HIGH102
        QQOU(4) = QQIN(4)                                                HIGH103
        QPRA    = 449.0*QQIN(4)/(NUNITH*UAREAH)                          HIGH104
        DS1     = SCIN(4)*SREFF1*(QPRA/695.0)*8.35*(10.0/1440.0)         HIGH105
        S1      = S1 + DS1                                               HIGH106
        QQRM(4) = 0.0                                                    HIGH107
        SCRM(4) = BIG                                                    HIGH108
        BCRM(4) = BIG                                                    HIGH109
        HO      = ((QPRA/QPRAMA)**1.18)*0.40*HM                          HIGH110
        HCL     = (QPRA/QPRAMA)*(S1/SQM)*0.60*HM                         HIGH111
        H       = HO + HCL                                               HIGH112
      IF (H .LT. HM)  GO TO 4390                                         HIGH113
        SBOD    = 0.0                                                    HIGH114
        S       = S1                                                     HIGH115
      ASSIGN 4320 TO LABEL                                               HIGH116
C                                                                        HIGH117
C                     ALL TIMESTEPS                                      HIGH118
 4390   BDOU(4) = QQOU(4)*BCOU(4)*0.646*8.35*DT/1440.0                   HIGH119
        SDOU(4) = QQOU(4)*SCOU(4)*0.646*8.35*DT/1440.0                   HIGH120
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      BDRM(4) = BDIN(4) - BDOU(4)                                        HIGH121
      SSRM(4) = SSIN(4) - SSOU(4)                                        HIGH122
      WARM(4) = QQRM(4)*DT*60.0                                          HIGH123
      WAOU(4) = WAIN(4) - WARM(4)                                        HIGH124
C                 DOSE POLYMERS AT 4 MG/L AND ALUM AT 150 MG/.           HIGH125
      CHEMUH = QQIN(4)*0.646*8.35*4.0*DT/1440.0                          HIGH126
      ALUMUH = QQIN(4)*0.646*8.35*150.0*DT/1440.0                        HIGH127
      CHEMUT(4) = CHEMUT(4) + CHEMUH                                     HIGH128
      ALUMUT    = ALUMUT    + ALUMUH                                     HIGH129
C                                                                        HIGH130
      RETURN                                                             HIGH131
      END                                                                HIGH132
C=======================================================================HIGH133
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```
      SUBROUTINE KILL(CONVOL,SCIF,SCIN,QQIN,CCIN,CCOU)                  KILL  1
C                                                                       KILL  2
C                   GIVEN THE FIRST 5 ARGUMENTS,                        KILL  3
C                   COMPUTES COLIFORM MPN IN OUTFLOW = CCOU             KILL  4
C                                                                       KILL  5
C                   COMPUTE FRACTION F DOSED (ASSUMING 15 MIN DETENT. TIKILL  6
C                                                                       KILL  7
        QKILL = CONVOL/(15.0*60.0)                                      KILL  8
      IF (QKILL .GT. QQIN)  QKILL = QQIN                                KILL  9
        F     = QKILL/QQIN                                              KILL 10
C                   COMPUTE MPN COLIFORMS AFTER REMIXING OF DOSED FRACTIKILL 11
        CCIN  = CCIN*SCIN/SCIF                                          KILL 12
        CCTR  = CCIN*0.001                                              KILL 13
        CCOU  = F*CCTR + (1.0-F)*CCIN                                   KILL 14
C                                                                       KILL 15
      RETURN                                                            KILL 16
      END                                                               KILL 17
C*****************************************************************KILL 18
```

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      SUBROUTINE STRAGE                                                 STRA  1
      COMMON  /STBK/QIN(150),BODIN(150),SUSIN(150),COLIN(150),          STRA  2
     *  QINST,QOLST,QINSTL,QOUSTL,STORL,QOUTO,STORO,                   STRA  3
     *  ISPRIN,IPCL,DEPMAX,COMAX,DEPTH,                                STRA  4
     *  ATERM(11),AO2DT2(11),BDEPTH(11),BSTOR(11),                     STRA  5
     *  DUMSTR(11),DUMDEP(11),                                         STRA  6
     *  VOLIN(150),VOLOUT(150),STOR,CUMIN,CUMOUT,                      STRA  7
     *  SBOD,SSS,SCOL,BODOUT,SUSOUT,COLOUT,                            STRA  8
     *  ISTMCD,ISTTYP,ISTOUT,                                          STRA  9
     *  QPUMP,CSTART,DSTOP,                                            STRA 10
     *  DTON,STORMX,DTPUMP,DTMORE,STORF,APLAN,                         STRA 11
     *  CLANC,CSTOR,CPS,CTOTAL,CPCUYD,CPACRE,                          STRA 12
     *  LP,JP,LPREV,LABEL,DETENT(150),FRAC(150)                        STRA 13
      COMMON  /TBLK/DT,NDT,KDT                                          STRA 14
C                                                                       STRA 15
      DT=DT*60.0                                                        STRA 16
      IF (KDT .GT. 1)  GO TO 1300                                       STRA 17
C                                                                       STRA 18
      IF (ISPRIN .GT. 0)  GO TO 1100                                    STRA 19
      GO TO 1200                                                        STRA 20
C                                                                       STRA 21
 1100 WRITE(6,601)  NDT                                                 STRA 22
  601 FORMAT('1STORAGE SOLUTION FOR', I4, ' TIME-STEPS FOLLOWS',        STRA 23
     *       ', ON A STEP-BY-STEP BASIS', //)                           STRA 24
      WRITE(6,602)                                                      STRA 25
  602 FORMAT('0U STP TIME INFLOW OUTFLOW  STORAGE DEPTH', 2X, 'IN: BOD',STRA 26
     *       5X, 'SS STOR: BOD', 7X, 'SS', 4X, 'BOD', 5X, 'SS OUT: BOD',STRA 27
     *       5X, 'SS', 4X, 'BOD', 5X, 'SS', 2X, ' J   L', /,          STRA 28
     *       ' N NO (MIN)  (CFS)  (CFS)   (CU.FT) (FT.)', 5X,         STRA 29
     *       '(LB)   (LB)', 6X, '(LB)', 5X, '(LB) (MG/L) (MG/L)', 5X, STRA 30
     *       '(LB)   (LB) (MG/L) (MG/L)', 2X, ' P   P', /)            STRA 31
C                                                                       STRA 32
 1200   STORMX = 0.0                                                    STRA 33
        LPREV  = 1                                                      STRA 34
        SBOD   = 0.0                                                    STRA 35
        SSS    = 0.0                                                    STRA 36
        SCOL   = 0.0                                                    STRA 37
        STOR   = STORO                                                  STRA 38
      DO 1230  I=1,11                                                   STRA 39
        DUMSTR(I) = BSTOR(I)                                            STRA 40
 1230   DUMDEP(I) = BDEPTH(I)                                           STRA 41
C                                                                       STRA 42
      CALL INTERP(DUMSTR,DUMDEP,11,STOR,DEPTH,KFLAG)                    STRA 43
C                                                                       STRA 44
      IF (KFLAG .EQ. -10)  GO TO 901                                    STRA 45
      IF (KFLAG .EQ.  10)  GO TO 902                                    STRA 46
C                                                                       STRA 47
        DEPTHL = DEPTH                                                  STRA 48
      IF (ISPRIN .LT. 1)  GO TO 1250                                    STRA 49
      WRITE(6,603)  QOUTO, STORO, DEPTH                                 STRA 50
  603 FORMAT('     0   0.0    0.0', F7.1, F10.0, F6.2)                  STRA 51
 1250 CONTINUE                                                          STRA 52
      WRITE(6,604)                                                      STRA 53
  604 FORMAT('   ')                                                     STRA 54
C-----------                                                            STRA 55
 1300 DO 1350  I=1,11                                                   STRA 56
        DUMSTR(I) = BSTOR(I)                                            STRA 57
 1350   DUMDEP(I) = BDEPTH(I)                                           STRA 58
        RKTSTP = KDT                                                    STRA 59
        TIME2P = DT*RKTSTP/60.0                                         STRA 60
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        BODOUT = 0.0                                                    STRA 61
        SUSOUT = 0.0                                                    STRA 62
        COLOUT = 0.0                                                    STRA 63
C                                                                       STRA 64
      IF (ISTOUT .EQ. 5 .OR. ISTOUT .EQ. 6)  GO TO 2000                 STRA 65
      GO TO 3000                                                        STRA 66
C-----------                                                            STRA 67
 2000 IF (KDT .GT. 1)  GO TO 2100                                       STRA 68
        QINSTL = 0.0                                                    STRA 69
        QOUSTL = COUTO                                                  STRA 70
        STORL  = STORO                                                  STRA 71
        CUMIN  = 0.0                                                    STRA 72
        CUMOUT = 0.0                                                    STRA 73
        STOR   = STORO                                                  STRA 74
        LP     = 0                                                      STRA 75
        JP     = 0                                                      STRA 76
        DTON   = 0.0                                                    STRA 77
C                                                                       STRA 78
 2100   VOLIN(KDT) = 0.5*DT*(QINSTL + QINST)                           STRA 79
        VOLOUZ = DT*QOUSTL                                              STRA 80
        STORZ  = STORL + VOLIN(KDT) - VOLOUZ                            STRA 81
C                                                                       STRA 82
      CALL INTERP(DUMSTR,DUMDEP,11,STORZ,DEPTHZ,KFLAG)                  STRA 83
C                                                                       STRA 84
      IF (KFLAG .EQ. -10)  GO TO 901                                    STRA 85
      IF (KFLAG .EQ.  10)  GO TO 902                                    STRA 86
C                                                                       STRA 87
C   ***             THE FOLLOWING STATEMENTS, ABOVE 2150, ARE TEMPORARY STRA 88
C                                                                       STRA 89
                                                                        STRA 90
                                                                        STRA 91
      IF (QINST .GT. QPUMP .AND. QOUSTL .EQ. 0.0)                       STRA 92
     *  GO TO 2120                                                     STRA 93
      GO TO 2150                                                        STRA 94
 2120   FON    = (QINST-QPUMP)/(QINST-QINSTL)                          STRA 95
        DSTART = DEPTHZ*(1.0-FON) + FON*DEPTHL                          STRA 96
        DTON   = DTON + FON                                             STRA 97
      WRITE(6,605)  DSTART                                              STRA 98
  605 FORMAT(' ', 60X, 'NEW DSTART =', F6.2, ' FT.')                    STRA 99
C                                                                       STRA100
 2150 IF (QOUSTL .EQ. 0.0 .AND. DEPTHZ .GT. DSTART)                     STRA101
     *  GO TO 2200                                                     STRA102
      IF (QOUSTL .GT. 0.0 .AND. DEPTHZ .LT. DSTOP )                     STRA103
     *  GO TO 2300                                                     STRA104
        QOUST  = QOUSTL                                                 STRA105
        VOLOUT(KDT) = VOLOUZ                                            STRA106
        STOR   = STORZ                                                  STRA107
        DEPTH  = DEPTHZ                                                 STRA108
      GO TO 2500                                                        STRA109
C                                                                       STRA110
 2200   FON    = (DEPTHZ - DSTART)/(DEPTHZ - DEPTHL)                    STRA111
        QOUST  = QPUMP                                                  STRA112
      GO TO 2400                                                        STRA113
C                                                                       STRA114
 2300   FON    = (DEPTHL - DSTOP)/(DEPTHL - DEPTHZ)                     STRA115
        QOUST  = 0.0                                                    STRA116
C                                                                       STRA117
 2400 IF (FON .LT. 0.0)  GO TO 8100                                     STRA118
        VOLOUT(KDT) = FON*DT*QPUMP                                      STRA119
        STOR   = STORL + VOLIN(KDT)-VOLOUT(KDT)                         STRA120
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```
C                                                                       STRA121
      CALL INTERP(DUMSTR,DUMDEP,11,STOR,DEPTH,KFLAG)                    STRA122
C                                                                       STRA123
      IF (KFLAG .EQ. -10)  GO TO 901                                    STRA124
      IF (KFLAG .EQ.  10)  GO TO 902                                    STRA125
C                                                                       STRA126
 2500   CUMIN  = CUMIN + VOLIN(KDT)                                     STRA127
        CUMOUT = CUMOUT + VOLOUT(KDT)                                   STRA128
        QINSTL = QINST                                                  STRA129
        QOUSTL = COUST                                                  STRA130
        DEPTHL = DEPTH                                                  STRA131
        STORL  = STOR                                                   STRA132
      IF (KDT .EQ. NDT)  STORF = STOR                                   STRA133
      IF (STOR .GT. STORMX)  STORMX = STOR                              STRA134
      IF (QOUST .GT. 0.0)  DTON = DTON + 1.0                            STRA135
      GO TO 4000                                                        STRA136
C------------                                                           STRA137
C                                                                       STRA138
 3000 CALL SROUTE                                                       STRA139
C                                                                       STRA140
      CALL INTERP(DUMSTR,DUMDEP,11,STOR,DEPTH,KFLAG)                    STRA141
C                                                                       STRA142
      IF (KFLAG .EQ. -10)  GO TO 901                                    STRA143
      IF (KFLAG .EQ.  10)  GO TO 902                                    STRA144
C                                                                       STRA145
C                     COMPUTE SEDIMENT AND BOD OUTFLOW                  STRA146
C                                                                       STRA147
C                                                                       STRA148
C                     DETERMINE PLUG FRACTIONS AND DETENTION TIMES      STRA149
C                                                                       STRA150
C                     CUMIN  = CUMULATIVE INFLOW (CU.FT.) SINCE T = 0   STRA151
C                     CUMOUT = CUMULATIVE OUTFLOW (CU.FT.) SINCE T = 0  STRA152
C                     SSIN   = SS INFLOW (LB) IN THIS TIME-STEP         STRA153
C                     BODIN  = BOD INFLOW (LB) IN THIS TIME-STEP        STRA154
C                     SBOD   = BOD (LB) IN RESERVOIR                    STRA155
C                     SSS    = SS  (LB) IN RESERVOIR                    STRA156
C                     BODOUT = BOD OUTFLOW (LB)                         STRA157
C                     SSOUT  = SS  OUTFLOW (LB)                         STRA158
C                     BODCOT = BOD OUTFLOW CONC. (MG/L)                 STRA159
C                     SSCOUT = SS  OUTFLOW CONC. (MG/L)                 STRA160
C                     SBODC  = BOD CONC. (MG/L) AVG. IN RESERVOIR       STRA161
C                     SSSC   = SS  CONC. (MG/L) AVG. IN RESERVOIR       STRA162
C                     MG/L   = 16050*(LB/CU.FT.)                        STRA163
C                                                                       STRA164
 3100 IF(KDT .GT. 1)  GO TO 3200                                        STRA165
        VOLIN(1)  = 0.5*QINST*DT                                        STRA166
        VOLOUT(1) = 0.5*(QOUST+QOUTO)*DT                                STRA167
        CUMIN  = VOLIN(1)                                               STRA168
        CUMOUT = VOLOUT(1)                                              STRA169
        SBOD   = 0.0                                                    STRA170
        SSS    = 0.0                                                    STRA171
        SOIL   = 0.0                                                    STRA172
        LPREV  = 1                                                      STRA173
        JP             = 0                                              STRA174
        LP             = 0                                              STRA175
      GO TO 4000                                                        STRA176
 3200   VOLIN(KDT)  = 0.5*(CINST+QINSTL)*DT                             STRA177
        VOLOUT(KDT) = 0.5*(COUST+QOUSTL)*DT                             STRA178
        CUMIN  = CUMIN  + VOLIN(KDT)                                    STRA179
        CUMOUT = CUMOUT + VOLOUT(KDT)                                   STRA180
```

```
C------------                                                          STRA181
 4000 IF(VOLOUT(KDT) .LE. 0.0)  GO TO 4200                             STRA182
C                                                                      STRA183
      CALL PLUGS                                                       STRA184
C                                                                      STRA185
      IF (LABEL .EQ. 5000)  GO TO 4200                                 STRA186
C                                                                      STRA187
C                    NOW HAVE, FOR EACH PLUG (FOR KP=JP,LP), ..        STRA188
C                         FRAC(KP),DETENT(KP)                          STRA189
C                                                                      STRA190
C                    MODEL ASSUMES..                                   STRA191
C                         NO SCOUR WITHIN BASIN                        STRA192
C                                                                      STRA193
C                    BRANCH FOR TYPE OF BASIN FLOW (IPOL)              STRA194
C                                                                      STRA195
        K = IPCL                                                       STRA196
      GO TO (4100,4180), K                                             STRA197
C                                                                      STRA198
C                    IPOL=1 ASSUMES 100% EFFICIENT PLUG FLOW           STRA199
C                                                                      STRA200
 4100 DO 4150  KP=JP,LP                                                STRA201
        BODOUT = BODOUT + BODIN(KP)*FRAC(KP)                           STRA202
        COLOUT = COLOUT + COLIN(KP)*FRAC(KP)                           STRA203
 4150   SUSOUT = SUSOUT  +  SUSIN(KP)*FRAC(KP)                        STRA204
C                                                                      STRA205
        BODCOT = BODCUT*16050.0/VOLOUT(KDT)                            STRA206
        SSCOUT = SUSOUT *16050.0/VOLOUT(KDT)                           STRA207
        COLCOT = COLOUT/(VOLOUT(KDT)*283.2)                            STRA208
      GO TO 4300                                                       STRA209
C                                                                      STRA210
C                    IPOL=2 ASSUMES 100% MIXING                        STRA211
C                                                                      STRA212
C                                                                      STRA213
C                    FOR THIS CASE, DON'T REALLY NEED SUBROUTINE PLUGS, STRA214
C                    OR (KDT) ON VOLIN, VOLOUT, SSIN, BODIN.           STRA215
C                                                                      STRA216
 4180   BODCCT = SBODC                                                 STRA217
        SSCOLT = SSSC                                                  STRA218
        COLCCT = SCOLC                                                 STRA219
        BODOUT = BODCCT*VOLOLT(KDT)/16050.0                            STRA220
        SUSOUT = SSCOUT*VOLCUT(KDT)/16050.0                            STRA221
        COLOUT = COLCOT*VOLOUT(KDT)*283.2                              STRA222
      GO TO 4300                                                       STRA223
C                                                                      STRA224
 4200   BODCCT = 0.0                                                   STRA225
        SSCOLT = 0.0                                                   STRA226
        COLCOT = 0.0                                                   STRA227
      IF (LPREV .GT. 1)  GO TO 4300                                    STRA228
        LP = 0                                                         STRA229
        JP = 0                                                         STRA230
C                                                                      STRA231
 4300   SBOD   = SBOD - BODOUT + BODIN(KDT)                            STRA232
        SSS    = SSS  - SUSOUT  +  SUSIN(KDT)                          STRA233
        SCOL   = SCOL - COLOUT + COLIN(KDT)                            STRA234
      IF (STOR .EQ. 0.0)  GO TO 4350                                   STRA235
        SBODC  = SBOD*16050.0/STOR                                     STRA236
        SSSC   = SSS *16050.0/STOR                                     STRA237
        SCOLC  = SCOL/(STOR*283.2)                                     STRA238
      GO TO 4400                                                       STRA239
 4350   SBODC  = 0.0                                                   STRA240
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        SSSC   = 0.0                                                    STRA241
        SCOLC  = 0.0                                                    STRA242
C                                                                       STRA243
 4400 IF (ISPRIN .LT. 1)  GO TO 5300                                    STRA244
C                                                                       STRA245
C                    PRINT SOLUTION FOR THIS TIME-STEP                  STRA246
C                                                                       STRA247
 5000 WRITE(6,606)  KDT,TIME2M,QINST,QOUST,                             STRA248
     *              STOR,DEPTH,BODIN(KDT),SUSIN(KDT),                  STRA249
     *              SBOD,SSS,SBCDC,SSSC,BODOUT,SUSOUT,                 STRA250
     *              BODCOT,SSCOUT,JP,LP                                STRA251
  606 FORMAT(' ', I4, F6.1, 2F7.1, F10.0, F6.2, 2X, 2F7.1, F10.1,       STRA252
     *       F9.1, 2F7.1, F9.1, 3F7.1, 2I4)                           STRA253
      WRITE(6,666)  COLIN(KDT), SCOL, SCOLC,COLOUT,COLCOT              STRA254
  666 FORMAT(' ', 40X, 'COLIN= ', 1PE9.2, 'SCOL(MPN)=', E9.2,           STRA255
     *       'CONC=', E9.2, 'COLOUT=', E9.2, 'CONC=', E9.2)           STRA256
      GO TO 5200                                                        STRA257
 5100 WRITE(6,606)  KDT,TIME2M,QINST,QOUST,                             STRA258
     *              STOR,DEPTH                                         STRA259
 5200 WRITE(6,6C4)                                                      STRA260
 5300 IF (KDT .LT. NDT)  GO TO 5400                                     STRA261
      IF (ISPRIN .LT. 1)  GO TO 5400                                    STRA262
      WRITE(6,6C7)  NDT, CUMIN, CUMOUT                                  STRA263
  607 FORMAT('0',  /, ' ', 26X, 'FOR THESE', I4, ' TIME STEPS ', /,      STRA264
     *       ' ', 36X, 'CUMULATIVE INFLOW  =', F12.0, ' CU.FT,', /,     STRA265
     *       ' ', 36X, 'CUMULATIVE OUTFLOW =', F12.0, ' CU.FT.')       STRA266
 5400 GO TO 9999                                                        STRA267
C                                                                       STRA268
C------------------ ERROR MESSAGES ---------------------------------- STRA269
C                                                                       STRA270
 8100 WRITE(6,692)                                                      STRA271
  692 FORMAT(' ', 14X, 'BUFFER VOLUME BETWEEN LEVELS DSTART AND DSTOP ',STRA272
     *       'IS TOO SMALL,', /,                                        STRA273
     *       ' ', 14X, 'RESULTING IN NEGATIVE VOLOUT (AND FON).')      STRA274
      GO TO 9999                                                        STRA275
C                                                                       STRA276
  901 IF (KFLAG .EQ. 10)  GO TO 902                                     STRA277
      WRITE(6,693)                                                      STRA278
  693 FORMAT('0 *** TERMINATE - INPUT TO INTERP PROCEDURE IS LESS THAN LSTRA279
     *OWEST VALUE ON CURVE (IN SUBRT. STORAG)')                         STRA280
      STOP 901                                                          STRA281
C                                                                       STRA282
  902 WRITE(6,694)                                                      STRA283
  694 FORMAT('C *** TERMINATE - INPUT TO INTERP PROCEDURE IS GREATER THASTRA284
     *N LARGEST VALUE ON CURVE (IN SUBRT. STORAG)')                     STRA285
      STOP 902                                                          STRA286
C                                                                       STRA287
 9999 DT=DT/60.0                                                        STRA288
      RETURN                                                            STRA289
      END                                                               STRA290
C=================================================================== STRA291
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      SUBROUTINE PLUGS                                                  PLUG  1
      COMMON  /STBK/QIN(150),BODIN(150),SUSIN(150),COLIN(150),          PLUG  2
     *  QINST,CCUST,CINSTL,COUSTL,STORL,QOUTO,STORO,                   PLUG  3
     *  ISPRIN,IPOL,DEPMAX,CCMAX,DEPTH,                                PLUG  4
     *  ATERM(11),AO2CT2(11),BDEPTH(11),BSTOR(11),                     PLUG  5
     *  DUMSTR(11),DUMDEP(11),                                         PLUG  6
     *  VOLIN(150),VOLOUT(150),STOR,CUMIN,CUMOUT,                      PLUG  7
     *  SBOD,SSS,SCOL,BODOUT,SUSOUT,COLOUT,                            PLUG  8
     *  ISTMOD,ISTTYP,ISTOUT,                                          PLUG  9
     *  QPUMP,CSTART,CSTOP,                                            PLUG 10
     *  DTON,STORMX,DTPUMP,DTMORE,STORF,APLAN,                         PLUG 11
     *  CLAND,CSTOR,CPS,CTOTAL,CPCUYD,CPACRE,                          PLUG 12
     *  LP,JP,LPREV,LABEL,DETENT(150),FRAC(150)                        PLUG 13
      COMMON  /TBLK/DT,NDT,KDT                                          PLUG 14
C                                                                       PLUG 15
C                   GIVEN KDT, VOLIN, VOLOUT & STORE ARRAYS, KDT & LPREVPLUG 16
C                   FINDS JP AND LP (NUMBERS OF FIRST AND LAST PART-PLUGPLUG 17
C                   COMPUTES DETENT AND FRAC ARRAYS (KP=JP,LP)          PLUG 18
C                   (SUBPROGRAM BY G.T.)                                PLUG 19
C                                                                       PLUG 20
      DT=DT*60.0                                                        PLUG 21
        LABEL  = 0                                                      PLUG 22
        LP     = KDT                                                    PLUG 23
        JP     = LPREV                                                  PLUG 24
        VIKK   = VOLIN(KDT)                                             PLUG 25
        VOKK   = VOLOUT(KDT)                                            PLUG 26
      SUM1 = 0.0                                                        PLUG 27
        SUM    = 0.0                                                    PLUG 28
 1000   SUM    = SUM + VOLIN(LP)                                        PLUG 29
      SUM1 = SUM + VOKK - VIKK                                          PLUG 30
        BACK = SUM1  - STOR                                             PLUG 31
      IF (BACK .GT. VOKK)  GO TO 1100                                   PLUG 32
      GO TO 1200                                                        PLUG 33
 1100   BACK = VOKK                                                     PLUG 34
 1200 IF(BACK) 1300,1400,2000                                           PLUG 35
 1300   LP     = LP - 1                                                 PLUG 36
      IF(LP-1)  5000,1000,1000                                          PLUG 37
C                                                                       PLUG 38
 1400 WRITE(6,601)                                                      PLUG 39
  601 FORMAT('0 A PART-PLUG = 0.  EXECUTION TERMINATED.')               PLUG 40
      STOP 1400                                                         PLUG 41
C                                                                       PLUG 42
 2000 IF(VIKK .LE. 0.0)  GO TO 4000                                     PLUG 43
      IF(LP .EQ. KDT)  GO TO 3000                                       PLUG 44
C                                                                       PLUG 45
C                     GENERAL CASE                                      PLUG 46
C                          A NUMBER OF PLUGS AND PART-PLUGS LEAVE       PLUG 47
C                                                                       PLUG 48
      IF(LP .EQ. 1)  GO TO 2500                                         PLUG 49
      IF(JP .GT. 1)  GO TO 2800                                         PLUG 50
        NN     = JP + 1                                                 PLUG 51
      IF(NN .EQ. LP)  GO TO 2600                                        PLUG 52
        SOUT   = 0.0                                                    PLUG 53
        M      = LP - 1                                                 PLUG 54
        NN     = JP + 1                                                 PLUG 55
      DO 2050  L=NN,M                                                   PLUG 56
 2050   SOUT   = SOUT + VOLIN(L)                                        PLUG 57
        SOUT   = SOUT + BACK                                            PLUG 58
        STOT   = SOUT + VOLIN(JP)                                       PLUG 59
      IF(STOT .GE. VOKK)  GO TO 2400                                    PLUG 60
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        FRAC(JP)= 1.0                                                   PLUG 61
 2100   RIJP    = KDT - JP                                             PLUG 62
        DETENT(JP) = RIJP*DT                                            PLUG 63
      DO 2200  L=NN,M                                                   PLUG 64
        FRAC(L)= 1.0                                                    PLUG 65
        RIL     = KDT - L                                               PLUG 66
 2200   DETENT(L) = RIL*DT                                             PLUG 67
 2300   FRAC(LP)= BACK/VOLIN(LP)                                       PLUG 68
        RILP    = KDT - LP                                              PLUG 69
        DETENT(LP) = RILP*DT                                            PLUG 70
        LPREV   = LP                                                    PLUG 71
      GO TO 9999                                                        PLUG 72
C                                                                       PLUG 73
 2400   FRONT   = VOKK - SOUT                                          PLUG 74
        FRAC(JP)= FRONT/VOLIN(JP)                                       PLUG 75
      GO TO 2100                                                        PLUG 76
C                                                                       PLUG 77
 2500   FRONT   = VOKK - BACK                                          PLUG 78
      GO TO 2300                                                        PLUG 79
C                                                                       PLUG 80
 2600   SOUT    = BACK + VOLIN(JP)                                     PLUG 81
      IF(SOUT .GE. VOKK)  GO TO 2700                                    PLUG 82
        FRAC(JP)= 1.0                                                   PLUG 83
        RIJP    = KDT - JP                                              PLUG 84
        DETENT(JP) = RIJP*DT                                            PLUG 85
      GO TO 2300                                                        PLUG 86
C                                                                       PLUG 87
 2700   FRONT   = VOKK - BACK                                          PLUG 88
        FRAC(JP)= FRONT/VOLIN(JP)                                       PLUG 89
        RIJP    = KDT - JP                                              PLUG 90
        DETENT(JP) = RIJP*DT                                            PLUG 91
      GO TO 2300                                                        PLUG 92
C                                                                       PLUG 93
 2800 IF (LP .EQ. JP)  GO TO 4100                                       PLUG 94
        NN      = JP + 1                                                PLUG 95
      IF(NN .EQ. LP)  GO TO 2700                                        PLUG 96
        SOUT    = 0.0                                                   PLUG 97
        M       = LP - 1                                                PLUG 98
      DO 2850  L=NN,M                                                   PLUG 99
 2850   SOUT    = SOUT + VOLIN(L)                                      PLUG100
        SOUT    = SOUT + BACK                                           PLUG101
      GO TO 2400                                                        PLUG102
C                                                                       PLUG103
C                    SPECIAL CASE                                       PLUG104
C                         INFLOW PLUG LARGER THAN BASIN VOLUME          PLUG105
C                                                                       PLUG106
 3000 IF(LP .EQ. 1)  GO TO 3700                                         PLUG107
      IF(JP .GT. 1)  GO TO 3800                                         PLUG108
        NN      = JP + 1                                                PLUG109
      IF(NN .EQ. LP)  GO TO 3500                                        PLUG110
        SOUT    = 0.0                                                   PLUG111
        M       = LP - 1                                                PLUG112
        NN      = JP + 1                                                PLUG113
      DO 3050  L=NN,M                                                   PLUG114
 3050   SOUT    = SOUT + VOLIN(L)                                      PLUG115
        SOUT    = SOUT + BACK                                           PLUG116
        STOT    = SOUT + VOLIN(JP)                                      PLUG117
      IF(STOT .GE. VOKK)  GO TO 3400                                    PLUG118
       FRAC(JP)= 1.0                                                    PLUG119
 3100   RIJP    = KDT - JP                                             PLUG120
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        DETENT(JP) = RIJP*DT                                          PLUG121
      DO 3200  L=NN,M                                                 PLUG122
        FRAC(L)= 1.0                                                  PLUG123
        RIL    = KDT - L                                              PLUG124
 3200   DETENT(L) = RIL*DT                                            PLUG125
 3300   FRAC(LP)= BACK/VOLIN(LP)                                      PLUG126
        DETENT(LP) = DT*STOR/VIKK                                     PLUG127
        LPREV  = LP                                                   PLUG128
      GO TO 9999                                                      PLUG129
C                                                                     PLUG130
 3400   FRONT  = VOKK - SOUT                                          PLUG131
        FRAC(JP)= FRONT/VOLIN(JP)                                     PLUG132
      GO TO 3100                                                      PLUG133
C                                                                     PLUG134
 3500   SOUT   = BACK + VOLIN(JP)                                     PLUG135
        RIJP   = KDT - JP                                             PLUG136
        DETENT(JP) = RIJP*DT                                          PLUG137
      IF(SOUT .GE. VOKK)  GO TO 3600                                  PLUG138
        FRAC(JP)= 1.0                                                 PLUG139
      GO TO 3300                                                      PLUG140
C                                                                     PLUG141
 3600   FRONT  = VOKK - BACK                                          PLUG142
        FRAC(JP)= FRONT/VOLIN(JP)                                     PLUG143
      GO TO 3300                                                      PLUG144
C                                                                     PLUG145
 3700   FRONT  = VOKK - BACK                                          PLUG146
        FRAC(LP)= BACK/VIKK                                           PLUG147
        DETENT(LP) = DT*STOR/VIKK                                     PLUG148
        LPREV  = LP                                                   PLUG149
      GO TO 9999                                                      PLUG150
C                                                                     PLUG151
 3800 IF (LP .EQ. JP)  GO TO 4100                                     PLUG152
        NN     = JP + 1                                               PLUG153
      IF(NN .EQ. LP)  GO TO 3600                                      PLUG154
        SOUT   = 0.0                                                  PLUG155
        M      = LP - 1                                               PLUG156
      DO 3850  L=NN,M                                                 PLUG157
 3850   SOUT   = SOUT + VOLIN(L)                                      PLUG158
        SOUT   = SOUT + BACK                                          PLUG159
        FRONT  = VOKK - SOUT                                          PLUG160
        FRAC(JP)= FRONT/VOLIN(JP)                                     PLUG161
      GO TO 3100                                                      PLUG162
C                                                                     PLUG163
C                    SPECIAL END CONDITION                            PLUG164
C                         NO INFLOW, OUTFLOW FROM STORAGE             PLUG165
C                                                                     PLUG166
 4000 IF (LP .EQ. JP)  GO TO 4100                                     PLUG167
        NN     = JP + 1                                               PLUG168
      IF(NN .EQ. LP)  GO TO 4200                                      PLUG169
        SOUT   = 0.0                                                  PLUG170
        M      = LP - 1                                               PLUG171
      DO 4050  L=NN,M                                                 PLUG172
 4050   SOUT   = SOUT + VOLIN(L)                                      PLUG173
        SOUT   = SOUT + SUM - STOR                                    PLUG174
      GO TO 2400                                                      PLUG175
C                                                                     PLUG176
 4100   FRAC(LP)= BACK/VOLIN(LP)                                      PLUG177
        RILP   = KDT - LP                                             PLUG178
        DETENT(LP) = RILP*DT                                          PLUG179
        LPREV  = LP                                                   PLUG180
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      GO TO 9999                                                        PLUG181
C                                                                       PLUG182
 4200   FRONT  = VOKK - BACK                                            PLUG183
        FRAC(JP)= FRONT/VOLIN(JP)                                       PLUG184
        RILP    = KDT - LP                                              PLUG185
        DETENT(JP) = RILP*DT                                            PLUG186
      GO TO 2300                                                        PLUG187
C                                                                       PLUG188
 5000   LABEL  = 5000                                                   PLUG189
      GO TO 9999                                                        PLUG190
C                                                                       PLUG191
 9999 DT=DT/60.0                                                        PLUG192
      RETURN                                                            PLUG193
      END                                                               PLUG194
C=======================================================================PLUG195
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      SUBROUTINE SROUTE                                                 SROU  1
      COMMON  /STBK/QIN(150),BODIN(150),SUSIN(150),COLIN(150),          SROU  2
     *  QINST,COLST,QINSTL,COUSTL,STORL,QOUTO,STORO,                   SROU  3
     *  ISPRIM,IPOL,DEPMAX,CCMAX,DEPTH,                                SROU  4
     *  ATERM(11),AO2DT2(11),BDEPTH(11),BSTOR(11),                     SROU  5
     *  DUMSTR(11),DUMDEP(11),                                         SROU  6
     *  VOLIN(150),VOLOUT(150),STOR,CUMIN,CUMOUT,                      SROU  7
     *  SBOD,SSS,SCOL,BODOUT,SUSOUT,COLOUT,                            SROU  8
     *  ISTMOD,ISTTYP,ISTOUT,                                          SROU  9
     *  QPUMP,CSTART,DSTOP,                                            SROU 10
     *  DTON,STORMX,DTPUMP,DTMORE,STORF,APLAN,                         SROU 11
     *  CLAND,CSTOR,CPS,CTOTAL,CPCOYD,CPACRE,                          SROU 12
     *  LP,JP,LPREV,LABEL,DETENT(150),FRAC(150)                        SROU 13
      COMMON  /TBLK/DT,NDT,KDT                                          SROU 14
      DIMENSION    DUMTRM(11),DUMAO2(11)                                SROU 15
C                                                                       SROU 16
      DT=DT*60.0                                                        SROU 17
C                                                                       SROU 18
C                     INPUTS ARE  DT, QINST, KDT, STORO,                SROU 19
C                                 QOUTO, ATERM(11), AO2DT2(11)          SROU 20
C                     OUTPUTS ARE QOUST, STORE(150)                     SROU 21
C                     NOTE..  ALL FLOWS ARE IN CFS.                     SROU 22
C                                                                       SROU 23
      IF (KDT .GT. 1)  GO TO 1000                                       SROU 24
C                                                                       SROU 25
C                     INITIALISE                                        SROU 26
C                                                                       SROU 27
        QINSTL = 0.0                                                    SROU 28
        QOUSTL = QOUTO                                                  SROU 29
        STORL  = STORO                                                  SROU 30
        DT2    = DT/2.0                                                 SROU 31
C                                                                       SROU 32
 1000   TERM   = (QINSTL + QINST)*DT2 - (QOUSTL*DT2                     SROU 33
     *           - STORL)                                               SROU 34
      IF (TERM .GE. 0.0)  GO TO 2000                                    SROU 35
      WRITE(6,601)  TERM, KDT                                           SROU 36
  601 FORMAT(' ', '** RESET TERM =', F12.5, ' TO ZERO  ', I10)          SROU 37
        TERM   = 0.0                                                    SROU 38
C                                                                       SROU 39
C                     FIND 'O2DT2' CORRESPONDING TO 'TERM' ABOVE,       SROU 40
C                     BY LINEAR INTERPOLATION.                          SROU 41
C                                                                       SROU 42
 2000 DO 2050  I=1,11                                                   SROU 43
        DUMTRM(I) = ATERM(I)                                            SROU 44
 2050   DUMAO2(I) = AO2DT2(I)                                           SROU 45
C                                                                       SROU 46
      CALL INTERP(DUMTRM,DUMAO2,11,TERM,O2DT2,KFLAG)                    SROU 47
C                                                                       SROU 48
      IF  (KFLAG .NE. 0)  GO TO 901                                     SROU 49
        STOR   = TERM - O2DT2                                           SROU 50
        QOUST = O2DT2/DT2                                               SROU 51
CC    WRITE(6,61)                                                       SROU 52
C                                                                       SROU 53
C                     INITIALISE FOR NEXT TIME-STEP                     SROU 54
C                                                                       SROU 55
        QINSTL = QINST                                                  SROU 56
        QOUSTL = QOUST                                                  SROU 57
        STORL  = STOR                                                   SROU 58
      GO TO 9999                                                        SROU 59
C                                                                       SROU 60
```

```
C---------           ERROR MESSAGES                                          SROU 61
C                                                                            SROU 62
  901 IF (KFLAG .EQ. 10)  GO TO 902                                          SROU 63
      WRITE(6,691)                                                           SROU 64
  691 FORMAT('0 *** TERMINATE - INPUT TO INTERP PROCEDURE IS LESS THAN LSROU 65
     *OWEST VALUE ON CURVE (IN SUBRT. ROUTE)')                               SROU 66
      STOP                                                                   SROU 67
C                                                                            SROU 68
  902 WRITE(6,692)                                                           SROU 69
  692 FORMAT('0 *** TERMINATE - INPUT TO INTERP PROCEDURE IS GREATER THASROU 70
     *N LARGEST VALUE ON CURVE (IN SUBRT. ROUTE)')                           SROU 71
      STOP                                                                   SROU 72
C                                                                            SROU 73
 9999 DT=DT/60.0                                                             SROU 74
      RETURN                                                                 SROU 75
      END                                                                    SROU 76
C=============================================================================SROU 77
```

```
      SUBROUTINE  SPRINT                                                SPRI  1
C                   COPIED BY EJF FROM RUN.AND.TRAN OF 17 AUG 70        SPRI  2
      COMMON  /TBLK/DT,NDT,KDT                                          SPRI  3
      COMMON  /BLK2/QQARR(150),BDARR(150)                               SPRI  4
      COMMON  /BLK3/JS,JNS,NPOLL,SSARR(150),COARR(150),POLL(160,5,5),   SPRI  5
     *              QQ(160,5)                                          SPRI  6
      DIMENSION  DUM(150)                                               SPRI  7
C                   PRINT INFLOWS                                       SPRI  8
      WRITE(6,921)                                                      SPRI  9
      WRITE(6,911)(I,I=1,10)                                            SPRI 10
      WRITE(6,912)  JNS,(QQARR(KDT),KDT=1,NDT)                          SPRI 11
      WRITE(6,922)                                                      SPRI 12
      WRITE(6,911)(I,I=1,10)                                            SPRI 13
      DO 217 K=1,NPOLL                                                  SPRI 14
      GO TO (30,33,36), K                                               SPRI 15
   30 WRITE(6,960)                                                      SPRI 16
      DO 31  KDT=1,NDT                                                  SPRI 17
   31   DUM(KDT) = BDARR(KDT)/DT                                        SPRI 18
   32 WRITE(6,912)  JNS,(DUM(KDT),KDT=1,NDT)                           SPRI 19
      GO TO 217                                                         SPRI 20
   33 WRITE(6,961)                                                      SPRI 21
      DO 34  KDT=1,NDT                                                  SPRI 22
   34   DUM(KDT) = SSARR(KDT)/DT                                        SPRI 23
      GO TO 32                                                          SPRI 24
   36 WRITE(6,963)                                                      SPRI 25
      DO 37  KDT=1,NDT                                                  SPRI 26
   37   DUM(KDT) = COARR(KDT)/DT                                        SPRI 27
      WRITE(6,967) JNS,(DUM(KDT),KDT=1,NDT)                             SPRI 28
  217 CONTINUE                                                          SPRI 29
C                   PRINT OUTFLOWS                                      SPRI 30
   29 WRITE(6,923)                                                      SPRI 31
      WRITE(6,911)(I,I=1,10)                                            SPRI 32
      WRITE(6,912) JNS,(QQ(KDT,JS),KDT=1,NDT)                           SPRI 33
  300 WRITE(6,924)                                                      SPRI 34
      WRITE(6,911)(I,I=1,10)                                            SPRI 35
      DO 219 K=1,NPOLL                                                  SPRI 36
      GO TO (40,42,46),K                                                SPRI 37
   40 WRITE(6,960)                                                      SPRI 38
      GO TO 161                                                         SPRI 39
   42 WRITE(6,961)                                                      SPRI 40
      GO TO 161                                                         SPRI 41
   46 WRITE(6,963)                                                      SPRI 42
  161 CONTINUE                                                          SPRI 43
      IF(K.NE.3) WRITE(6,912) JNS,(POLL(KDT,K,JS),KDT=1,NDT)            SPRI 44
      IF(K.EQ.3) WRITE(6,967) JNS,(POLL(KDT,K,JS),KDT=1,NDT)            SPRI 45
  219 CONTINUE                                                          SPRI 46
C                   FIND TOTAL OUTPUT OF SS AND BOD IN POUNDS           SPRI 47
CC    TSSOUT=0.0                                                        SPRI 48
CC    TBODOT=0.0                                                        SPRI 49
CC    DO 1000 J=1,NDT                                                   SPRI 50
CC    TSSOUT=TSSOUT+OUT2(NNPE,J,2)*DT/60.                               SPRI 51
CC    TBODOT=TBODOT+OUT2(NNPE,J,1)*DT/60.                               SPRI 52
C1000 CONTINUE                                                          SPRI 53
      WRITE(06,924)                                                     SPRI 54
      WRITE(6,911)(I,I=1,10)                                            SPRI 55
      DO 236 K=1,NPOLL                                                  SPRI 56
      GO TO (50,52,56),K                                                SPRI 57
   50 WRITE(6,968)                                                      SPRI 58
      GO TO 234                                                         SPRI 59
   52 WRITE(6,969)                                                      SPRI 60
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```
      GO TO 234                                                          SPRI 61
   56 WRITE(6,966)                                                       SPRI 62
  234 CONTINUE                                                           SPRI 63
      DO 235 KDT=1,NDT                                                   SPRI 64
      IF(QO(KDT,JS).EQ.0.0) GO TO 237                                    SPRI 65
      IF(K.NE.3) DUM(KDT) = POLL(KDT,K,JS)*267.5/QO(KDT,JS)              SPRI 66
      IF(K.EQ.3) DUM(KDT) = POLL(KDT,K,JS)/(QO(KDT,JS)*17040.0)          SPRI 67
      GO TO 238                                                          SPRI 68
  237 DUM(KDT)=0.0                                                       SPRI 69
  238 CONTINUE                                                           SPRI 70
  235 CONTINUE                                                           SPRI 71
      IF(K.NE.3) WRITE(6,912)JNS,(DUM(KDT),KDT=1,NDT)                    SPRI 72
      IF(K.EQ.3) WRITE (6,967)JNS,(DUM(KDT),KDT=1,NDT)                   SPRI 73
  236 CONTINUE                                                           SPRI 74
CC    WRITE(C6,965) JNS,TSSOUT,JNS,TBODOT                               SPRI 75
CC965 FORMAT('1'/'0',5X,'TOTAL POUNDS OF SUSPENDED SOLIDS OUTPUT FROM ELSPRI 76
CC   *EMENT ',I4,' =',F10.2//' ',5X,'TOTAL POUNDS OF FIVE-DAY BOD OUTPUTSPRI 77
CC   * FROM ELEMENT ',I4,' =',F10.2////)                                SPRI 78
                                                                         SPRI 79
  311 RETURN                                                             SPRI 80
  911 FORMAT(' EXTERNAL'/' ELEMENT    TIME STEP'/' NUMBER', 3X,          SPRI 81
     *       10(I6,4X))                                                  SPRI 82
  912 FORMAT('0',I6,4X,10F10.3,/' ',(10X,10F10.3))                       SPRI 83
  921 FORMAT('1', /, ' ', 50X, 'INLET HYDROGRAPH - CFS')                 SPRI 84
  922 FORMAT('0', /, ' ', 52X, 'INLET POLLUTOGRAPHS')                    SPRI 85
  923 FORMAT('C', /, ' ', 45X, 'TREATED OUTFLOW HYDROGRAPH - CFS')       SPRI 86
  924 FORMAT('C', /, ' ', 46X, 'TREATED OUTFLOW POLLUTOGRAPHS')          SPRI 87
  960 FORMAT('0', 50X, '*** BOD IN LB/MIN ***')                          SPRI 88
  961 FORMAT('C', 44X, '** SUSPENDED SOLIDS IN LB/MIN **')               SPRI 89
  963 FORMAT('0', 46X, '*** COLIFORMS IN MPN/MIN ***')                   SPRI 90
  966 FORMAT('0', 45X, '***COLIFORMS IN MPN/100ML ***')                  SPRI 91
  967 FORMAT('0', I6, 4X, 1P10E10.2, /, ' ', (10X, 10E10.2))             SPRI 92
  968 FORMAT('C', 50X, '*** BOD IN MG/L ***')                            SPRI 93
  969 FORMAT('0', 44X, '*** SUSPENDED SOLIDS IN MG/L ***')               SPRI 94
      END                                                                SPRI 95
C=======================================================================
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      SUBROUTINE TRCOST                                                 TRCO  1
      COMMON  CONVER,KHOUR,KMIN,L,KMCD,NFLAG,BIG,HEAD1,HEAD2,           TRCO  2
     *  QDESYN,CQIF,WAQU(7),WAIN(7),QQOU(7),QQIN(7),WARM(7),QQRL,       TRCO  3
     *  BDIF,CORM(7),BDOU(7),BDIN(7),BCOU(7),BCIN(7),BDRL,              TRCO  4
     *  SSIF,SSIN(7),SSOU(7),SCOU(7),SCIN(7),SSRM(7),SSRL,COIF,CORL,    TRCO  5
     *  ADEPTH(11),AASURF(11),ITREAT(7),ISTOR,IPRINT,ICOST,HRFD,        TRCO  6
     *  MODSIZ,ICHEM,ICL2,SCREEN,QQIFMX,DESF,IRANGE,KNTOF,TRIBA,SEDA,   TRCO  7
     *  SQM,SREFFH,BREFFH,NUNITH,UAREAH,UPRAMA,ICHEMH,HM,VOLDAF,ITABLE, TRCO  8
     *  MODCST,TOTCST,RECIRC,UVRDAF,TSURFA,OVRSED,NSED,JM(7),WTRMT5,     TRCO  9
     *  NSCRN,SCRCAP,SUAREA,FAREAB,NMS,AREAMS,VOLCON,VOLSED,ALUMUT,     TRCO 10
     *  BDINT(7),SSINT(7),WAINT(7),BDOUT(7),SSOUT(7),WAOUT(7),          TRCO 11
     *  WARMT(7),BORMT(7),SSRMT(7),CHEMUT(8),CL2UT(8),QMOD(20),WTRMT1,  TRCO 12
     *  QQRMT(7),QQOUT(7),QQRMMX(7),QQOUMX(7),QQRMMN(7),QQOUMN(7),      TRCO 13
     *  BCRMT(7),BCOUT(7),BCRMMX(7),BCOUMX(7),BCRMMN(7),BCOUMN(7),      TRCO 14
     *  SCRMT(7),SCOUT(7),SCRMMX(7),SCOUMX(7),SCRMMN(7),SCOUMN(7),      TRCO 15
     *  BORM(7),BCRM(7),SCRM(7)                                         TRCO 16
      COMMON  /BLK1/NAME(4,21)                                          TRCO 17
      COMMON  /STBK/QIN(150),BODIN(150),SUSIN(150),COLIN(150),          TRCO 18
     *  QINST,CCUST,QINSTL,COUSTL,STORL,QOUTO,STORO,                    TRCO 19
     *  ISPRIN,IPOL,DEPMAX,QCMAX,DEPTH,                                 TRCO 20
     *  ATERM(11),AG2DT2(11),BDEPTH(11),BSTOR(11),                      TRCO 21
     *  DUMSTR(11),DUMDEP(11),                                          TRCO 22
     *  VOLIN(150),VOLOUT(150),STOR,CUMIN,CUMOUT,                       TRCO 23
     *  SBOD,SSS,SCOL,BODOUT,SUSOUT,COLOUT,                             TRCO 24
     *  ISTMCD,ISTTYP,ISTOUT,                                           TRCO 25
     *  QPUMP,DSTART,DSTOP,                                             TRCO 26
     *  DTON,STORMX,DTPUMP,DTMORE,STORF,APLAN,                          TRCO 27
     *  CLANC,CSTOR,CPS,CTOTAL,CPCUYD,CPACRE,                           TRCO 28
     *  LP,JP,LPREV,LABEL,DETENT(150),FRAC(150)                         TRCO 29
      DIMENSION  ENR(15),NYEAR(7),ADJ(7),CAPCST(7),ALAND(7),CLACST(7),  TRCO 30
     *           ANNCST(7),ALACST(7),BASICM(7),CHCOST(7),OTHCST(7),     TRCO 31
     *           IENR(15),CL2CST(7)                                     TRCO 32
C                                                                       TRCO 33
      IF (ICOST .LT. 1)  GO TO 9999                                     TRCO 34
C                                                                       TRCO 35
      WRITE(6,601)                                                      TRCO 36
  601 FORMAT('1SUMMARY OF TREATMENT COSTS' ,/)                          TRCO 37
C                                                                       TRCO 38
C                     READ AND WRITE GENERAL COST PARAMETERS            TRCO 39
C                                                                       TRCO 40
      READ (5,501)  RATEPC, NYRS, MODYR, SITEF                          TRCO 41
  501 FORMAT(F10.2, 2I10, F10.4)                                        TRCO 42
      IF (MODYR .LT. 1970)  GO TO 9100                                  TRCO 43
      IF (MODYR .GT. 1980)  GO TO 9200                                  TRCO 44
C                     DEFAULT VALUES                                    TRCO 45
      IF (RATEPC .EQ. 0.0)  RATEPC = 7.00                               TRCO 46
      IF (NYRS   .EQ.   0)  NYRS   =   25                               TRCO 47
      IF (SITEF  .EQ. 0.0)  SITEF  = 1.00                               TRCO 48
        CRC = (1.C + 0.01*RATEPC)**NYRS                                 TRCO 49
        CRF = C.01*RATEPC*CRC/(CRC - 1.0)                               TRCO 50
        KENR= MODYR - 1969                                              TRCO 51
      READ(5,502)  (IENR(I), I=1,11)                                    TRCO 52
  502 FORMAT(8I10)                                                      TRCO 53
      WRITE(6,603)                                                      TRCO 54
  603 FORMAT('C', 15X, 'ASSUMED FUTURE ENGINEERING NEWS RECORD INDICES',TRCO 55
     *    /, ' ', 15X, 'CONSTRUCTION  -  20 CITY AVERAGE', /,          TRCO 56
     *       'C', 23X, 'YEAR', 5X, 'ENR INDEX', /)                     TRCO 57
      DO 700  I=1,11                                                    TRCO 58
        ENR(I) = IENR(I)                                                TRCO 59
        KYEAR = 1969 + I                                                TRCO 60
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      WRITE(6,605)  KYEAR, IENR(I)                                          TRCO 61
  605 FORMAT(' ', 21X, I6, 5X, I6)                                          TRCO 62
  700 CONTINUE                                                              TRCO 63
C                                                                           TRCO 64
C                     READ GENERAL UNIT COSTS                               TRCO 65
C                                                                           TRCO 66
      READ(5,504)  UCLAND,UCPOWR,UCCL2,UCPOLY,UCALUM                        TRCO 67
  504 FORMAT(F10.0,F10.5,3F10.2)                                            TRCO 68
C                                                                           TRCO 69
C                     UCLAND = UNIT COST OF LAND,      $/ACRE               TRCO 70
C                     UCPOWR = UNIT COST OF POWER,     $/KWH                TRCO 71
C                     UCCL2  = UNIT COST OF CHLORINE, $/LB                  TRCO 72
C                     UCPOLY = UNIT COST OF POLYMERS, $/LB                  TRCO 73
C                     UCALUM = UNIT COST OF ALUM,      $/LB                 TRCO 74
C                     RATEPC = INTEREST RATE FOR AMORTIZATION, PERCENT      TRCO 75
C                     NYRS   = AMORTIZATION PERIOD, YEARS                   TRCO 76
C                     MODYR  = YEAR OF MODEL, FOR COSTS                     TRCO 77
C                     SITEF  = AN ENR FACTOR FOR GEOGRAPHIC LOCATION OF STRCO 78
C                     L      = LEVEL NUMBER                                 TRCO 79
C                     ENR    = ENG. NEWS RECORD COST INDEX, FOR YEAR & LOTRCO 80
C                                                                           TRCO 81
C                    DEFAULT VALUES                                         TRCO 82
      IF (UCLAND .EQ. 0.0)  UCLAND = 20000.0                                TRCO 83
      IF (UCPOWR .EQ. 0.0)  UCPOWR =     0.02                               TRCO 84
      IF (UCCL2  .EQ. 0.0)  UCCL2  =     0.20                               TRCO 85
      IF (UCPOLY .EQ. 0.0)  UCPOLY =     1.25                               TRCO 86
      IF (UCALUM .EQ. 0.0)  UCALUM =     0.03                               TRCO 87
      WRITE(6,602)  RATEPC, NYRS, CRF, MODYR, SITEF                         TRCO 88
  602 FORMAT('0', 15X, 'COST PARAMETERS . .', /,                            TRCO 89
     *       ' ', 20X, 'INTEREST RATE        =', F10.2, ' PERCENT', /,      TRCO 90
     *       ' ', 20X, 'AMORTIZATION PERIOD  =',   I10, ' YEARS', /,        TRCO 91
     *       ' ', 20X, 'CAP. RECOVERY FACTOR =', F10.4, /,                  TRCO 92
     *       ' ', 20X, 'YEAR OF SIMULATION   =',   I10, /,                  TRCO 93
     *       ' ', 20X, 'SITE LOCATION FACTOR =', F10.4)                     TRCO 94
C                                                                           TRCO 95
      WRITE(6,604)  UCLAND,UCPOWR,UCCL2,UCPOLY,UCALUM                       TRCO 96
  604 FORMAT('0', 15X, 'UNIT COSTS . .', /,                                 TRCO 97
     *       ' ', 20X, 'LAND     =', F10.2, '  $/ACRE', /,                  TRCO 98
     *       ' ', 20X, 'POWER    =', F11.3,  ' $/KWH', /,                   TRCO 99
     *       ' ', 20X, 'CHLORINE =', F11.3,  ' $/LB', /,                    TRCO100
     *       ' ', 20X, 'POLYMERS =', F11.3,  ' $/LB', /,                    TRCO101
     *       ' ', 20X, 'ALUM     =', F10.2,  '  $/LB')                      TRCO102
C                                                                           TRCO103
C                    INITIALIZE                                             TRCO104
C                                                                           TRCO105
      DO 900  L=1,7                                                         TRCO106
        CAPCST(L) = 0.0                                                     TRCO107
        ALAND(L)  = 0.0                                                     TRCO108
        CLACST(L) = 0.0                                                     TRCO109
        ANNCST(L) = 0.0                                                     TRCO110
        ALACST(L) = 0.0                                                     TRCO111
        BASICM(L) = 0.0                                                     TRCO112
        CL2CST(L) = 0.0                                                     TRCO113
        CHCOST(L) = 0.0                                                     TRCO114
  900   OTHCST(L) = 0.0                                                     TRCO115
C                                                                           TRCO116
C                    CAPCST = CAPITAL COST OF INSTALLED EQUIPMENT, $        TRCO117
C                    ALAND  = AREA OF LAND REQIRED FOR THIS EQUIP, ACRESTRCO118
C                    CLACST = CAPITAL COST OF LAND REQUIRED, $              TRCO119
C                    ANNCST = AMORTIZED COST OF INSTALLED EQUIPMENT, $/YTRCO120
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C                    ALACST = AMORTIZED COST OF LAND REQUIRED, $/YEAR    TRC0121
C                    BASICM = COST OF MINIMUM MAINTENENCE (NO STORMS), $TRC0122
C                    CL2CST = COST OF CHLORINE, $/STORM                  TRC0123
C                    CHCOST = COST OF POLYMERS AND ALUM, $/STORM         TRC0124
C                    OTHCST = ALL OTHER STORM COSTS, $/STORM             TRC0125
C                                                                        TRC0126
        Q    = QMOD(KMOD)                                                TRC0127
        QMGD = Q                                                         TRC0128
      IF (Q .LT. 12.0)  Q = 12.0                                         TRC0129
C                                                                        TRC0130
C---------           LEVEL 1 BRANCH (FOR TREATMENT BY BAR RACKS)         TRC0131
C                                                                        TRC0132
 1000   K = ITREAT(1) - 10                                               TRC0133
        L = 1                                                            TRC0134
      GO TO (2000,1200), K                                               TRC0135
C                                                                        TRC0136
C                    12)  FOR BAR RACKS                                  TRC0137
C                                                                        TRC0138
 1200 IF (SCRCAP .LT. 120.0)  SCRCAP = 120.0                             TRC0139
        CAPCST(1) = NSCRN*(11000.0 + 1000.0*(SCRCAP-120.0)/240.0)        TRC0140
     *                    *ENR(KENR)/1000.0                             TRC0141
C                      BASED ON JACKSONVILLE, 1959  (ENR = 790),ADJ TO ENTRC0142
      IF (QMGD .LE. 100.0)  CAPCST(1) = CAPCST(1) +                      TRC0143
     *                1000.0*10.0*QMGD**0.625                           TRC0144
     *                      *ENR(KENR)/1034.0                           TRC0145
      IF (QMGD .GT. 100.0)  CAPCST(1) = CAPCST(1) +                      TRC0146
     *                1000.0*(QMGD/100.0)*178.0                         TRC0147
     *                      *ENR(KENR)/1034.0                           TRC0148
        CAPCST(1) = CAPCST(1)*SITEF                                      TRC0149
C                     BASED ON 20 CITIES AV, ASSUMED 1966 (ENR = 1034)   TRC0150
        ALAND(1)  = (2700.0 + 3.0*QDESYN)/43560.0                        TRC0151
        CLACST(1) = ALAND(1)*UCLAND*ENR(KENR)/ENR(1)                     TRC0152
        ANNCST(1) = CAPCST(1)*CRF                                        TRC0153
        ALACST(1) = CLACST(1)*0.01*RATEPC                                TRC0154
        BASICM(1) = CAPCST(1)*0.01                                       TRC0155
        CL2CST(1) = 0.0                                                  TRC0156
        CHCOST(1) = 0.0                                                  TRC0157
        OTHCST(1) = 20.0 + 0.07*WTRMT1*ENR(KENR)/250.0                   TRC0158
C                      BASED ON WORCESTER, 1940  (ENR = 250)             TRC0159
C                                                                        TRC0160
C---------           LEVEL 2 BRANCH (FOR INLET PUMPING)                  TRC0161
C                                                                        TRC0162
 2000   K = ITREAT(2) - 20                                               TRC0163
        L = 2                                                            TRC0164
      GO TO (3000,2200), K                                               TRC0165
C                                                                        TRC0166
C                    22)  FOR INLET PUMPING (STATION)                    TRC0167
C                                                                        TRC0168
 2200   CAPCST(2) = 25000.0*(QMGD**0.58)*SITEF*ENR(KENR)/1314.0          TRC0169
      IF (QMGD .GT. 20.0)                                                TRC0170
     *  CAPCST(2) = 16000.0*(QMGD**0.73)*SITEF*ENR(KENR)/1314.0          TRC0171
      IF (QMGD .GT. 100.0)                                               TRC0172
     *  CAPCST(2) = QMGD*(16000.0/(100.0**0.27))*SITEF*ENR(KENR)/1314.0  TRC0173
        H = HEAD1                                                        TRC0174
      IF (H .LT. 10.0)  H = 10.0                                         TRC0175
        CAPCST(2) = CAPCST(2) + (H-10.0)*(0.0017 +                       TRC0176
     *              (ALOG10(QMGD)-0.778)*0.00095/1.824)                 TRC0177
        ALAND(2)  = QMGD*(975.0-QMGD)*6.0/(475.0*43560.0)                TRC0178
        CLACST(2) = ALAND(2)*UCLAND*ENR(KENR)/ENR(1)                     TRC0179
        ANNCST(2) = CAPCST(2)*CRF                                        TRC0180
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        ALACST(2) = CLACST(2)*0.01*RATEPC                                  TRC0181
        BASICM(2) = CAPCST(2)*0.02                                         TRC0182
        CL2CST(2) = 0.0                                                    TRC0183
        CHCOST(2) = 0.0                                                    TRC0184
        OTHCST(2) = 15.00 + UCPOWR*62.4*QDESYN*H/(550.0*1.341*0.7)         TRC0185
C                                                                          TRC0186
C--------           LEVEL 3 BRANCH (FOR PRIMARY TREATMENT)                 TRC0187
C                                                                          TRC0188
 3000   K = ITREAT(3) - 30                                                 TRC0189
        L = 3                                                              TRC0190
      GO TO (4000,3200,3200,3400,3500), K                                  TRC0191
C                                                                          TRC0192
C                    32) & 33)  FOR DISSOLVED AIR FLOATATION               TRC0193
C                                                                          TRC0194
C                    BASED ON BAKER ST, SAN FRANCISCO, ADJUSTED            TRC0195
 3200 IF (QMGD .LE. 15.0) CAPCST(3) = 1.35*QMGD*                           TRC0196
     *    EXP(2.3026/(0.2075 + 0.0114*ALOG10(QMGD)))                       TRC0197
      IF (QMGD .GT. 15.0 .AND. QMGD .LE. 100.0)                            TRC0198
     *    CAPCST(3) = 1.35*QMGD*EXP(2.3026*(4.6032 -                       TRC0199
     *                  0.0559*ALOG10(QMGD)))                              TRC0200
      IF (QMGD .GT. 100.0)  CAPCST(3) = 28000.0*1.35*QMGD                  TRC0201
C                     BASED ON 20 CITIES AV, 1967 (ENR = 1098)             TRC0202
        CAPCST(3) = CAPCST(3)*SITEF*ENR(KENR)/1098.0                       TRC0203
C                   ADD FOR MECH. SCRAPERS IF NOT PRECEEDED BY FINE SCRETRC0204
      IF (ITREAT(3) .EQ. 33)  CAPCST(3) = CAPCST(3) + 500.0*QMGD           TRC0205
C                   ADD FOR CHLORINATOR (GAS FEED ASS'D) IF CHLORINE ADDTRC0206
      IF (ICL2 .GT. 0)  CAPCST(3) = CAPCST(3) + 500.0*QMGD                 TRC0207
C                   ADD FOR DOSING EQUIP IF POLYMERS ADDED                 TRC0208
C??   IF (ICHEM ¬GT¬ ))                                                    TRC0209
        ALAND(3)  = 10000.0*QMGD/(25.0*43560.0)                            TRC0210
        RQLAND = 2.0*TSURFA/43560.0                                        TRC0211
      IF (ALAND(3) .LT. RQLAND)  ALAND(3) = RQLAND                         TRC0212
        CLACST(3) = ALAND(3)*UCLAND*ENR(KENR)/ENR(1)                       TRC0213
        ANNCST(3) = CAPCST(3)*CRF                                          TRC0214
        ALACST(3) = CLACST(3)*0.01*RATEPC                                  TRC0215
        BASICM(3) = CAPCST(3)*0.02                                         TRC0216
        CL2CST(3) = CL2UT(3)*UCCL2                                         TRC0217
        CHCOST(3) = CHEMUT(3)*UCPOLY                                       TRC0218
        OTHCST(3) = WAINT(3)*1000.0*0.004 + 15.00                          TRC0219
      IF (ITREAT(3) .EQ. 33)  GO TO 3400                                   TRC0220
      GO TO 4000                                                           TRC0221
C                                                                          TRC0222
C                    33) & 34)  FOR FINE SCREENS                           TRC0223
C                                                                          TRC0224
 3400   CAPSC     = QMGD*12000.0*SITEF*ENR(KENR)/1314.0                     TRC0225
        CAPCST(3) = CAPCST(3) + CAPSC                                      TRC0226
        ALSC      = (Q/6.0)*3000.0/(43560.0*SQRT(Q/6.0))                   TRC0227
        ALAND(3)  = ALAND(3) + ALSC                                        TRC0228
        CLASC     = ALSC*UCLAND                                            TRC0229
        CLACST(3) = ALAND(3)*UCLAND*ENR(KENR)/ENR(1)                       TRC0230
        ANNCST(3) = CAPCST(3)*CRF                                          TRC0231
        ANNSC     = CAPSC*CRF                                              TRC0232
        ALACST(3) = CLACST(3)*0.01*RATEPC                                  TRC0233
        ALASC     = CLASC*0.01*RATEPC                                      TRC0234
        BMSC      = CAPSC*0.02                                             TRC0235
        BASICM(3) = BASICM(3) + BMSC                                       TRC0236
        CL2CST(3) = 0.0 + CL2CST(3)                                        TRC0237
        CHCOST(3) = 0.0 + CHCOST(3)                                        TRC0238
        OTHSC     = WAINT(3)*1000.0*0.006 + 15.00                          TRC0239
        OTHCST(3) = OTHCST(3) + OTHSC                                      TRC0240
```

```
      GO TO 4000                                                        TRC0241
C                                                                       TRC0242
C                     35)  FOR SEDIMENTATION                            TRC0243
C                                                                       TRC0244
 3500 GO TO (3600,3700), ISTOR                                          TRC0245
C                     IN NEW SED TANKS                                  TRC0246
 3600   CAPCST(3) = 43000.0*(QMGD*700.0/OVRSED)**0.91                   TRC0247
      IF (QMGD .GT. 100.0)  CAPCST(3) = 430.0*QMGD*(70000./OVRSED)**0.91TRC0248
        CAPCST(3) = CAPCST(3)*SITEF*ENR(KENR)/1000.0                    TRC0249
C                     BASED ON 20 CITIES AV, 1967 (ENR = 1098), ADJUSTED TRC0250
        ALAND(3)  = Q*1C00000.0*2.0/(OVRSED*43560.0)                    TRC0251
        OTHCST(3) = WAINT(3)*1000.0*0.004 + 15.00                       TRC0252
      GO TO 3800                                                        TRC0253
C                     IN STORAGE                                        TRC0254
 3700   CAPCST(3) = CPCUYD*(STORMX/27.0)*SITEF*ENR(KENR)/1314.0         TRC0255
        ALAND(3)  = APLAN/43560.0                                       TRC0256
        OTHCST(3) = WAINT(3)*1000.0*0.005                               TRC0257
C                     IN EITHER                                         TRC0258
 3800   CLACST(3) = ALAND(3)*UCLAND*ENR(KENR)/ENR(1)                    TRC0259
        ANNCST(3) = CAPCST(3)*CRF                                       TRC0260
        ALACST(3) = CLACST(3)*0.01*RATEPC                               TRC0261
        BASICM(3) = CAPCST(3)*0.01                                      TRC0262
        CHCOST(3) = 0.0                                                 TRC0263
        CL2CST(3) = CL2UT(3)*UCCL2                                      TRC0264
C                                                                       TRC0265
C---------            LEVEL 4 BRANCH (FOR SECONDARY TREATMENT)          TRC0266
C                                                                       TRC0267
 4000   K = ITREAT(4) - 40                                              TRC0268
        L = 4                                                           TRC0269
      GO TO (5000,4200,4300), K                                         TRC0270
C                                                                       TRC0271
C                     42)  FOR MICROSTRAINERS                           TRC0272
C                                                                       TRC0273
 4200   CAPCST(4) = 20000.0                                             TRC0274
      IF (QMGD .LT. 25.0)  CAPCST(4) = 30000.0                          TRC0275
        CAPCST(4) = CAPCST(4)*QMGD*SITEF*ENR(KENR)/1314.0               TRC0276
C                     BASED ON 20 CITIES AV, 1970 (ENR = ENR(1))        TRC0277
        ALAND(4)  = 0.50*Q*3000.0/(43560.0*SQRT(Q/12.0))                TRC0278
      IF (QMGD .LT. 25.0)  ALAND(4) = ALAND(4)*1.333                    TRC0279
        CLACST(4) = ALAND(4)*UCLAND*ENR(KENR)/ENR(1)                    TRC0280
        ANNCST(4) = CAPCST(4)*CRF                                       TRC0281
        ALACST(4) = CLACST(4)*0.01*RATEPC                               TRC0282
        BASICM(4) = CAPCST(4)*0.02                                      TRC0283
        CHCOST(4) = 0.0                                                 TRC0284
        CL2CST(4) = 0.0                                                 TRC0285
C                     BASED ON HANOVER PARK                             TRC0286
        OTHCST(4) = WAINT(4)*1000.0*0.006 + 15.00                       TRC0287
      GO TO 5000                                                        TRC0288
C                                                                       TRC0289
C                     43)  FOR HIGH RATE FILTERS                        TRC0290
C                                                                       TRC0291
 4300   CAPCST(4) = 0.6*90000.0*QMGD**0.67                              TRC0292
        CAPCST(4) = CAPCST(4)*SITEF*ENR(KENR)/1058.0                    TRC0293
C                     BASED ON 20 CITIES AV, 1967  (ENR = 1058)         TRC0294
        ALAND(4)  = Q*1000000.0*2.5/(1440.0*20.0*43560.0)               TRC0295
        CLACST(4) = ALAND(4)*UCLAND*ENR(KENR)/ENR(1)                    TRC0296
        ANNCST(4) = CAPCST(4)*CRF                                       TRC0297
        ALACST(4) = CLACST(4)*0.01*RATEPC                               TRC0298
        BASICM(4) = CAPCST(4)*0.02                                      TRC0299
        CHCOST(4) = CHEMUT(4)*UCPOLY                                    TRC0300
```

```
        CL2CST(4) = 0.0                                                      TRC0301
        OTHCST(4) = MAINT(4)*1000.0*0.010 + 15.00                            TRC0302
C                                                                            TRC0303
C---------          LEVEL 5 BRANCH (FOR EFFLUENT SCREENS)                    TRC0304
C                                                                            TRC0305
 5000   K = ITREAT(5) - 50                                                   TRC0306
        L = 5                                                                TRC0307
      GO TO (6000,5200), K                                                   TRC0308
C                                                                            TRC0309
C                   52)  FOR EFFLUENT SCREENS                                TRC0310
C                                                                            TRC0311
 5200 IF (QMGD .GE. 100.0)  GO TO 5210                                       TRC0312
        CAPCST(5) = QMGD*(5000.0/QMGD**0.7)*SITEF*ENR(KENR)/1314.0           TRC0313T
C                   INSTALLATION BASED ON 20 CITIES AV, 1970                 TRC0314
        CAPCST(5) = CAPCST(5) + 0.7*1000.0*10.0*(QMGD**0.625)*               TRC0315
     *                          SITEF*ENR(KENR)/1034.0                       TRC0316
C                   CHANNEL WKS BASED ON 20 CITIES AV, ASSUMED 1966 (ENRTRC0317
      GO TO 5220                                                             TRC0318
 5210   CAPCST(5) = QMGD*200.0*SITEF*ENR(KENR)/1314.0                        TRC0319
C                   INSTALLATION BASED ON 20 CITIES AV, 1970                 TRC0320
        CAPCST(5) = CAPCST(5) + 0.7*1000.0*(QMGD/100.0)*178.0*               TRC0321
     *                          SITEF*ENR(KENR)/1034.0                       TRC0322
C                   CHANNEL WKS BASED ON 20 CITIES AV, ASSUMED 1966 (ENRTRC0323
 5220   ALAND(5)  = (2700.0 + 3.0*QDESYN)/43560.0                            TRC0324
        CLACST(5) = ALAND(5)*UCLAND*ENR(KENR)/ENR(1)                         TRC0325
        ANNCST(5) = CAPCST(5)*CRF                                            TRC0326
        ALACST(5) = CLACST(5)*0.01*RATEPC                                    TRC0327
        BASICM(5) = CAPCST(5)*0.015                                          TRC0328
        CHCOST(5) = 0.0                                                      TRC0329
        CL2CST(5) = 0.0                                                      TRC0330
        OTHCST(5) = 15.0 + 0.30*WTRMT5*1000.0/250.0                          TRC0331
C                     BASED ON WORCESTER, 1940  (ENR = 250)                  TRC0332
      GO TO 6000                                                             TRC0333
C                                                                            TRC0334
C---------          LEVEL 6 BRANCH (FOR OUTLET PUMPING)                      TRC0335
C                                                                            TRC0336
 6000   K = ITREAT(6) - 60                                                   TRC0337
        L = 6                                                                TRC0338
      GO TO (7000,6200), K                                                   TRC0339
C                                                                            TRC0340
C                   62)  FOR OUTLET PUMPING (STATION)                        TRC0341
C                                                                            TRC0342
 6200   CAPCST(6) = 25000.0*(QMGD**0.58)*SITEF*ENR(KENR)/1314.0              TRC0343
      IF (QMGD .GT. 20.0)                                                    TRC0344
     *  CAPCST(6) = 16000.0*(QMGD**0.73)*SITEF*ENR(KENR)/1314.0              TRC0345
      IF (QMGD .GT. 100.0)                                                   TRC0346
     *  CAPCST(6) = QMGD*(16000.0/(100.0**0.27))*SITEF*ENR(KENR)/1314.0      TRC0347
        H = HEAD2                                                            TRC0348
      IF (H .LT. 10.0)  H = 10.0                                             TRC0349
        CAPCST(6) = CAPCST(6) + (H-10.0)*(0.0017 +                           TRC0350
     *              (ALOG10(QMGD)-0.778)*0.00095/1.824)                      TRC0351
        ALAND(6)  = QMGD*(975.0-QMGD)*6.0/(475.0*43560.0)                    TRC0352
        CLACST(6) = ALAND(6)*UCLAND*ENR(KENR)/ENR(1)                         TRC0353
        ANNCST(6) = CAPCST(6)*CRF                                            TRC0354
        ALACST(6) = CLACST(6)*0.01*RATEPC                                    TRC0355
        BASICM(6) = CAPCST(6)*0.02                                           TRC0356
        CL2CST(6) = 0.0                                                      TRC0357
        CHCOST(6) = 0.0                                                      TRC0358
        OTHCST(6) = 15.00 + UCPOWR*62.4*QDESYN*H/(550.0*1.341*0.8)           TRC0359
C                                                                            TRC0360
```

```
C---------          LEVEL 7 BRANCH (FOR CHLORINE CONTACT TIME)
C
 7000   K = ITREAT(7) - 70
        L = 7
      GO TO (8000,7200), K
C
C                   72)  FOR CHLORINE CONTACT TANK
C
 7200   CAPCST(7) = 18350.0*QMGD**0.628*SITEF*ENR(KENR)/1000.0
C                   ABOVE COSTS INCLUDE CHLORINATOR
C                   BASED ON AVERAGE B/T SMITH'S FIG. 16 AND M&E COST
C                   CURVE BY RICH (ENR=1000)
        ALAND(7)  = 1.15*VOLCON/(10.0*43560.0)
        CLACST(7) = ALAND(7)*UCLAND*ENR(KENR)/ENR(1)
        ANNCST(7) = CAPCST(7)*CRF
        ALACST(7) = CLACST(7)*0.01*RATEPC
        BASICM(7) = CAPCST(7)*0.02
        CL2CST(7) = CL2UT(7)*UCCL2
        CHCOST(7) = 0.0
        OTHCST(7) = 15.00
C
C-----------         PREPARE AND PRINT COST SUMMARY
C
 8000   CPCSTT = 0.0
        ALANDT = 0.0
        CLCSTT = 0.0
        ANCSTT = 0.0
        ALCSTT = 0.0
        BSICMT = 0.0
        C2CSTT = 0.0
        CHCSTT = 0.0
        OTCSTT = 0.0
      DO 8100  L=1,7
        CPCSTT = CPCSTT + CAPCST(L)
        ALANDT = ALANDT + ALAND(L)
        CLCSTT = CLCSTT + CLACST(L)
        ANCSTT = ANCSTT + ANNCST(L)
        ALCSTT = ALCSTT + ALACST(L)
        BSICMT = BSICMT + BASICM(L)
        C2CSTT = C2CSTT + CL2CST(L)
        CHCSTT = CHCSTT + CHCOST(L)
 8100   OTCSTT = OTCSTT + OTHCST(L)
        CAPTOT = CPCSTT + CLCSTT
        ANNTOT = ANCSTT + ALCSTT + BSICMT
        STMTOT = C2CSTT + CHCSTT + OTCSTT
      WRITE(6,681)
  681 FORMAT('0', 39X, 'CAPITAL   COSTS', 13X, 'ANNUAL   COSTS', 16X,
     *       'STORM  EVENT  COSTS')
      WRITE(6,682)
  682 FORMAT(' ', 26X, '_________  ___________________  _____________',
     *       '_________________  ______________________________')
      WRITE(6,683)
  683 FORMAT(' ', 11X, 'TREATMENT', 8X, 'LEVEL', 6X, 'INSTAL      ',
     *       'LAND      INSTAL      LAND    MIN MAINT   CHLORINE   ',
     *       '  CHEM      OTHER')
      WRITE(6,684)
  684 FORMAT(' ', 24X, 9('  _________') )
      DO 8200  L=1,7
        J = JM(L)
 8200 WRITE(6,685)  (NAME(I,J), I=1,4), L, CAPCST(L), CLACST(L),
```

```
     *              ANNCST(L), ALACST(L), BASICM(L), CL2CST(L),                TRC0422
     *              CHCOST(L), OTHCST(L)                                       TRC0423
  685 FORMAT(' ', 8X, 4A4, 5X, I2, F14.0, 7F11.0)                              TRC0424
      IF (ITREAT(3) .EQ. 33)  WRITE(6,686)  CAPSC, CLASC, ANNSC, ALASC,        TRC0425
     *                                      BMSC, OTHSC                        TRC0426
  686 FORMAT(' ', 8X, '( FINE SCREENS )', 5X, '(3A)  (', F9.0,                 TRC0427
     *       4(')(', F9.0), ')(', 2(7X, '0.)('), F9.0, ')' )                   TRC0428
      WRITE(6,684)                                                             TRC0429
      WRITE(6,687)  CPCSTT, CLCSTT, ANCSTT, ALCSTT, BSICMT, C2CSTT,           TRC0430
     *              CHCSTT, OTCSTT                                             TRC0431
  687 FORMAT('0', 26X, 'SUBTOTAL', 8(' $', F9.0))                              TRC0432
      WRITE(6,682)                                                             TRC0433
      WRITE(6,688)  CAPTOT, ANNTOT, STMTOT                                     TRC0434
  688 FORMAT('0', 26X, 'TOTAL', 9X, '$', F10.0, 16X, '$', F10.0, 22X,          TRC0435
     *       '$', F10.0)                                                       TRC0436
      WRITE(6,682)                                                             TRC0437
C                                                                              TRC0438
        CAPTOT = CAPTOT/TRIBA                                                  TRC0439
        ANNTOT = ANNTOT/TRIBA                                                  TRC0440
        STMTOT = STMTOT/TRIBA                                                  TRC0441
      WRITE(6,680)  CAPTOT, ANNTOT, STMTOT                                     TRC0442
  680 FORMAT('0', 26X, 'TOTAL PER', /,                                         TRC0443
     *       ' ', 26X, 'TRIB ACRE', 5X, '$', F10.0, 16X, '$', F10.0,          TRC0444
     *       22X, '$', F10.0)                                                  TRC0445
      WRITE(6,682)                                                             TRC0446
      WRITE(6,689)  ALANDT                                                     TRC0447
  689 FORMAT('0', /, '0', 26X, 'TOTAL LAND REQUIREMENT =',                     TRC0449
     *       F10.2, ' ACRES.')                                                 TRC0449
      GO TO 9999                                                               TRC0450
C                                                                              TRC0451
C------------------ ERROR MESSAGES ------------------------------------------TRC0452
C                                                                              TRC0453
 9000 WRITE(6,690)  L, ITREAT(L)                                               TRC0454
  690 FORMAT('0*** ITREAT(', I1, ') = ', I2,                                   TRC0455
     *       ' IS OF A TYPE NOT PRESENTLY MODELED.  EXECUTION STOPPED')        TRC0456
      STOP                                                                     TRC0457
C                                                                              TRC0458
 9100 WRITE(6,691)  MODYR                                                      TRC0459
  691 FORMAT('0***  YEAR OF MODEL =', I6, ' IS BEFORE 1970',                   TRC0460
     *       ', WHICH IS NOT ACCEPTABLE TO THIS PROGRAM.')                     TRC0461
      STOP                                                                     TRC0462
C                                                                              TRC0463
 9200 WRITE(6,692)  MODYR                                                      TRC0464
  692 FORMAT('0***  YEAR OF MODEL =', I6, ' IS AFTER 1980',                    TRC0465
     *       ', WHICH IS NOT ACCEPTABLE TO THIS PROGRAM.')                     TRC0466
      STOP                                                                     TRC0467
C                                                                              TRC0468
C                                                                              TRC0469
 9999 RETURN                                                                   TRC0470
      END                                                                      TRC0471
C=============================================================================TRC0472
```

```
      SUBROUTINE INTERP(X, Y, L, XE, YE, K)                                 INTE  1
      DIMENSION X(L),Y(L)                                                   INTE  2
C                                                                           INTE  3
C                     GIVEN XE, INTERPOLATES LINEARLY FOR YE                INTE  4
C                     FLAGS M/PROG WITH K-VALUE, IF XE OUTSIDE RANGE        INTE  5
C                     ( FROM MCCRACKEN, PP. 61-64 )                         INTE  6
C                                                                           INTE  7
      IF (XE .GE. X(1) )  GO TO 2000                                        INTE  8
C                                                                           INTE  9
C                     XE IS .LT. LOWEST VALUE ON CURVE                      INTE 10
 1000   K  = -10                                                            INTE 11
      GO TO 9999                                                            INTE 12
C                                                                           INTE 13
C                     SEARCH FOR SMALLEST X(J) .GT. XE                      INTE 14
 2000 DO 2050  J=2,L                                                        INTE 15
      IF (XE-X(J) )  4000,3000,2050                                         INTE 16
 2050 CONTINUE                                                              INTE 17
C                     XE IS .GT. LARGEST VALUE ON CURVE                     INTE 18
C                                                                           INTE 19
        K  = 10                                                             INTE 20
      GO TO 9999                                                            INTE 21
C                                                                           INTE 22
C                     XE COINCIDES WITH AN X(J), SO INTERPOLATION UNNECESSINTE 23
 3000   YE = Y(J)                                                           INTE 24
      GO TO 5000                                                            INTE 25
C                                                                           INTE 26
C                     NOW X(J) IS THE SMALLEST VALUE .GT. XE.               INTE 27
C                     COMPUTE YE BY LINEAR INTERPOLATION.                   INTE 28
C                                                                           INTE 29
 4000   YE = Y(J-1) + (Y(J)-Y(J-1))*(XE-X(J-1))/(X(J)-X(J-1))               INTE 30
 5000   K  = 0                                                              INTE 31
C                                                                           INTE 32
 9999 RETURN                                                                INTE 33
      END                                                                   INTE 34
```

```
C=======================================================================BLOC  1
      BLOCK DATA                                                        BLOC  2
      COMMON  /BLK1/NAME(4,21)                                          BLOC  3
      DATA  NAME /                          4HNO S, 4HEP. , 4HSTOR, 4HAGE ,BLOC  4
     * 4H STO, 4HRAGE, 4H ROU, 4HTED ,     4H  NO, 4H BAR, 4H RAC, 4HKS  ,BLOC  5
     * 4H   B, 4HAR R, 4HACKS, 4H    ,     4HNO I, 4HNLET, 4H PUM, 4HPING,BLOC  6
     * 4H INL, 4HET P, 4HUMPI, 4HNG  ,     4H BYP, 4HASS , 4HLEVE, 4HL 3 ,BLOC  7
     * 4HDISS, 4H AIR, 4H FLO, 4HAT'N,     4HFINE, 4H SCR, 4H + D, 4H.A.F,BLOC  8
     * 4H  FI, 4HNE S, 4HCREE, 4HNS  ,     4H SED, 4HIMEN, 4HTATI, 4HON  ,BLOC  9
     * 4H BYP, 4HASS , 4HLEVE, 4HL 4 ,     4H MIC, 4HROST, 4HRAIN, 4HERS ,BLOC 10
     * 4HHIGH, 4HRATE, 4H FIL, 4HTERS,     4HNO E, 4HFFL., 4H SCR, 4HEENS,BLOC 11
     * 4HEFFL, 4HUENT, 4H SCR, 4HEENS,     4HNO O, 4HUTLE, 4HT PU, 4HMPS ,BLOC 12
     * 4H OUT, 4HLET , 4HPUMP, 4HING ,     4HNO C, 4HONTA, 4HCT T, 4HANK ,BLOC 13
     * 4H  CO, 4HNTAC, 4HT TA, 4HNK  ,     4H    , 4HSTOR, 4HAGE , 4H    /BLOC 14
      END                                                               BLOC 15
C=======================================================================BLOC 16
```

Section 5

RECEIVING WATER BLOCK

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Subroutine	INDATA	203
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```
      SUBROUTINE INDATA                                                 INDA   1
C                                                                       INDA   2
C                                                                       INDA   3
C                                       INPUT DATA                      INDA   4
C                                       HYDRODYNAMICS PROGRAM           INDA   5
C                                       SPECIFICATION STATEMENTS        INDA   6
C                                                                       INDA   7
C                                                                       INDA   8
C                                       CONTROL                         INDA   9
C                                                                       INDA  10
      COMMON /CONTR/ N5,N6,N20,N21,  NTCYC,NQCYC,NHCYC,  NT,NQSWRT      INDA  11
     1,  DELTQ,DELT,TZERO,   ISWCH(10)                                  INDA  12
C                                                                       INDA  13
C                                       GENERAL                         INDA  14
C                                                                       INDA  15
      COMMON  ALPHA(30),  NJ,NC,   ICYC,KCYC,NCYC,   WIND,WDIR,EVAP     INDA  16
     1,  PRECP(50),NEXIT                                                INDA  17
C                                                                       INDA  18
C                                       JUNCTIONS                       INDA  19
C                                                                       INDA  20
      COMMON  H(100),HN(100),HT(100),HBAR(100),HAVE(100)                INDA  21
     1,  NCHAN(100,8),IPOINT(100,8),AS(100),VOL(100),X(100),Y(100)      INDA  22
     2,  DEP(100),COF(100),QIN(100),QOU(100),QINST(100)                 INDA  23
     3,  QINBAR(100),QOUBAR(100)                                        INDA  24
C                                                                       INDA  25
C                                       CHANNELS                        INDA  26
C                                                                       INDA  27
      COMMON LEN(225),NJUNC(225,2),B(225),R(225),A(225),AT(225),AK(225) INDA  28
     1,   Q(225),QBAR(225),QAVE(225),  V(225),VT(225),VBAR(225)         INDA  29
     2, FWINC(225),NUMCH(225),NTEMP(8)                                  INDA  30
     3,NCLOS(225)                                                       INDA  31
C                                                                       INDA  32
C                                       PRINTOUT AND PLOTTING           INDA  33
C                                                                       INDA  34
      COMMON   NPRT,IPRT,   NHPRT,JPRT(50),PRTH(30,50)                  INDA  35
     1,  NQPRT,CPRT(50),PRTV(30,50),PRTQ(30,50),  IDUM(12),ICOL(10)     INDA  36
     2,  LTIME,  NPLT,NPDEL,JPLT(50),HPLT(50)                           INDA  37
                                                                        INDA  38
C                                                                       INDA  39
C                                       STAGE-TIME COEFFICIENTS         INDA  40
C                                                                       INDA  41
      COMMON YY(50) ,TT(50) ,AA(10),XX(10),SXX(10,10),SXY(10)           INDA  42
     1,A1,A2,A3,A4,A5,A6,A7,PERIOD,JGW                                  INDA  43
C                                                                       INDA  44
C                                       STORMWATER                      INDA  45
C                                                                       INDA  46
      COMMON  TITLE(30),NJSW,QE(20,2),JSW(20)                           INDA  47
     2, RAIN(100),INTIME(100),INRAIN,JBOUND(20),JJBOUN                  INDA  48
C                                                                       INDA  49
C                                       TAPES                           INDA  50
      COMMON /TAPES/ INCNT,IOUTCT,JIN(10),JOUT(10),NSCRAT(5)            INDA  51
C                                                                       INDA  52
C                                       TYPE DESIGNATIONS               INDA  53
C                                                                       INDA  54
      DATA ASTERK,BLANK /4H****,4H                                      INDA  55
      INTEGER CPRT                                                      INDA  56
      REAL LEN,INTIME                                                   INDA  57
C                                                                       INDA  58
C                                       OPTION SWITCH, ISWCH(I)         INDA  59
C                                                                       INDA  60
```

```
C                                       ISWCH(1)                                INDA 61
C                                       IF 1, WILL CALL TIDAL                   INDA 62
C                                       COEFFICIENTS PROGRAM                    INDA 63
C                                       ISWCH(2)                                INDA 64
C                                       IF 1, SUPPRESSES CHANNEL AND            INDA 65
C                                       NODAL INFORMATION PRINT                 INDA 66
C                                                                               INDA 67
C                                       STEP ONE                                INDA 68
C                                       INITIALIZATION                          INDA 69
C                                                                               INDA 70
      N5=5                                                                      INDA 71
      N6=6                                                                      INDA 72
C                                       N20 ASSIGNED IN RECEIV                  INDA 73
      REWIND N20                                                                INDA 74
C                                                                               INDA 75
C                                       STEP TWO                                INDA 76
C                                       TITLES, GENERAL CONTROL DATA,           INDA 77
C                                       AND JUNCTION AND CHANNEL INFOR-         INDA 78
C                                       MATION                                  INDA 79
C                                                                               INDA 80
C                                                                               INDA 81
C                                       READ TYPE A CARDS                       INDA 82
C                                       (FIRST TWO CARDS CONTAIN HEAD-          INDA 83
C                                       INGS FOR HYDRODYNAMICS, SECOND          INDA 84
C                                       TWO CARDS CONTAIN HEADINGS              INDA 85
C                                       FOR IDENTIFICATION OF STORMWATER        INDA 86
C                                       INFORMATION)                            INDA 87
C                                                                               INDA 88
      READ(N5,100) ALPHA                                                        INDA 89
      READ(N5,100) TITLE                                                        INDA 90
  100 FORMAT(15A4)                                                              INDA 91
      WRITE(N6,102) ALPHA                                                       INDA 92
  102 FORMAT(1H1,15A4,20X,31HWATER RESOURCES ENGINEERS, INC./1H ,15A4,20X,      INDA 93
     1 24HWALNUT CREEK, CALIFORNIA/1H ,80X,29HRECEIVING WATER HYDRODYNAMI       INDA 94
     2CS//)                                                                     INDA 95
C                                                                               INDA 96
C                                       READ TYPE B CARDS                       INDA 97
C                                       SWITCH INFORMATION                      INDA 98
C                                                                               INDA 99
      READ (N5,104) (ISWCH(I),I=1,10)                                           INDA100
  104 FORMAT (10I5)                                                             INDA101
C                                                                               INDA102
C                                       READ TYPE C CARDS                       INDA103
C                                       CONTROL INFORMATION                     INDA104
C                                                                               INDA105
      READ (N5,106) NTCYC,PERIOD,QINT,DELT,TZERO,NHPRT,NQPRT,NPLT,EVAP          INDA106
     1,WIND,WDIR,NQSWRT,NJSW,INRAIN,JGW                                         INDA107
  106 FORMAT (I5,4F5.0,3I5,3F5.0,4I5)                                           INDA108
      IPERID = PERIOD + 0.1                                                     INDA109
      IQINT=QINT*3600.+0.1                                                      INDA110
      IDELT = DELT + 0.1                                                        INDA111
      NQCYC=(IPERID *3600)/IQINT                                                INDA112
      NHCYC = IQINT/IDELT                                                       INDA113
      NINT = (IPERID*3600)/IDELT                                                INDA114
      NPDEL = (NINT+50)/100                                                     INDA115
C                                                                               INDA116
C                                       READ TYPE D CARDS                       INDA117
C                                       PRECIPITATION IS READ AT THIS           INDA118
C                                       POINT, RATE IS INCHES PER HOUR,         INDA119
C                                       TIME IS READ IN MINUTES FROM            INDA120
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```
C                                    START OF STORM                          INDA121
C                                                                            INDA122
      DO 210 N=1,100                                                         INDA123
      RAIN(N)=0.0                                                            INDA124
      INTIME(N)=0.0                                                          INDA125
  210 CONTINUE                                                               INDA126
      IF (INRAIN.EQ.0) GO TO 215                                             INDA127
      READ(N5,110)(RAIN(I),INTIME(I),I=1,INRAIN)                             INDA128
  110 FORMAT (8F10.0)                                                        INDA129
  215 CONTINUE                                                               INDA130
      DELTQ=DELT*FLOAT(NHCYC)                                                INDA131
      WRITE(N6,112) NTCYC                                                    INDA132
  112 FORMAT (15HODAYS SIMULATED,I4)                                         INDA133
      WRITE(N6,114) NQCYC                                                    INDA134
  114 FORMAT (29HOWATER QUALITY CYCLES PER DAY,I4)                           INDA135
      WRITE (N6,116) NHCYC                                                   INDA136
  116 FORMAT (43HOINTEGRATION CYCLES PER WATER QUALITY CYCLE,I4)             INDA137
      WRITE (6,118) DELT                                                     INDA138
  118 FORMAT (30HOLENGTH OF INTEGRATION STEP IS,F6.0,8H SECONDS)             INDA139
      WRITE (6,120) TZERO                                                    INDA140
  120 FORMAT (13HOINITIAL TIME,F6.2,6H HOURS)                                INDA141
      WRITE(N6,122)EVAP                                                      INDA142
  122 FORMAT(18HOEVAPORATION RATE,F5.1,17H INCHES PER MONTH)                 INDA143
      WRITE(N6,124)WIND,WDIR                                                 INDA144
  124 FORMAT(15HOWIND VELOCITY,F5.0,22H MPH   WIND DIRECTION,F5.0,19H DEINDA145
     1GREES FROM NORTH)                                                      INDA146
      IF (ISWCH(1).NE.1) GO TO 216                                           INDA147T
      WRITE (N6,126)                                                         INDA148T
  126 FORMAT (16HOESTURIAL SYSTEM)                                           INDA148A
      GO TO 218                                                              INDA148B
  216 CONTINUE                                                               INDA148C
      WRITE (N6,127)                                                         INDA148D
  127 FORMAT (19HOSTREAM/LAKE SYSTEM)                                        INDA148E
  218 CONTINUE                                                               INDA148F
      WRITE (N6,128) NQSWRT                                                  INDA149
  128 FORMAT (26HOWRITE CYCLE STARTS AT THE,I4,11H TIME CYCLE//)             INDA150
      IF (INRAIN.LE.0) GO TO 225                                             INDA151
      WRITE (N6,130)                                                         INDA152
  130 FORMAT(75HORAIN IN INCHES PER HOUR, AND TIME IN MINUTES, MEASURED      INDA153
     1FROM START OF STORM/)                                                  INDA154
      WRITE (N6,131)                                                         INDA155
  131 FORMAT (15X,8H IN./HR.,2X,8H MINUTES,4X,8H IN./HR.,2X,8H MINUTES,      INDA156
     14X,8H IN./HR.,2X,8H MINUTES,4X,8H IN./HR.,2X,8H MINUTES,4X,8H IN./INDA157
     2HR.,2X,8H MINUTES/)                                                    INDA158
      DO 220 I = 1,100,5                                                     INDA159
      L = MIN0(I + 4,100)                                                    INDA160
      WRITE (N6,132) I, L, (RAIN(J),INTIME(J), J=I,L)                        INDA161
  132 FORMAT (14,' TO ',13, 10F11.3)                                         INDA162
  220 CONTINUE                                                               INDA163
      DO 222 I=1,100                                                         INDA164
  222 INTIME(I)=INTIME(I)*60.                                                INDA165
      GO TO 230                                                              INDA166
  225 CONTINUE                                                               INDA167
      WRITE (N6,133)                                                         INDA168
  133 FORMAT (23HONO PRECIPITATION INPUT)                                    INDA169
  230 CONTINUE                                                               INDA170
C                                                                            INDA171
C                                    READ TYPE E CARDS                       INDA172
C                                    JUNCTION NUMBERS FOR DETAILED           INDA173
C                                    PRINTOUT                                INDA174
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C                                                                       INDA175
      READ(N5,134)(JPRT(I),I=1,NHPRT)                                   INDA176
  134 FORMAT(8I10)                                                      INDA177
      WRITE(N6,136)NHPRT,(JPRT(I),I=1,NHPRT)                            INDA178
  136 FORMAT (32HOPRINTED OUTPUT AT THE FOLLOWING,I3,10H JUNCTIONS,//   INDA179
     1 (10X,16I6))                                                      INDA180
C                                                                       INDA181
C                                       READ TYPE F CARDS               INDA182
C                                       CHANNEL NUMBERS FOR DETAILED    INDA183
C                                       PRINTOUT                        INDA184
C                                                                       INDA185
      READ(N5,134)(CPRT(I),I=1,NQPRT)                                   INDA186
      WRITE(N6,138)NCPRT,(CPRT(I),I=1,NQPRT)                            INDA187
  138 FORMAT(//15X,21HAND FOR THE FOLLOWING13,9H CHANNELS//(10X,8I10))  INDA188
C                                                                       INDA189
C                                       READ TYPE G CARDS               INDA190
C                                       READ THE JUNCTION NUMBERS IF    INDA191
C                                       PLOTS ARE REQUESTED, OTHERWISE  INDA192
C                                       SKIP THIS READ                  INDA193
C                                                                       INDA194
      IF (NPLT.NE.0) READ(N5,134) (JPLT(N),N=1,NPLT)                    INDA195
C                                                                       INDA196
C                                       TIDAL OPTION AT THIS POINT      INDA197
C                                                                       INDA198
      IF (ISWCH(1).NE.1) GO TO 560                                      INDA199
      READ (N5,140) KD,NI,MAXIT,NCHTID                                  INDA200
  140 FORMAT (4I5)                                                      INDA201
      READ (N5,142) (TT(I),YY(I),I=1,NI)                                INDA202
  142 FORMAT (8F10.0)                                                   INDA203
      CALL TIDCF(KD,NI,MAXIT,NCHTID)                                    INDA204
      GO TO 580                                                         INDA205
  560 CONTINUE                                                          INDA206
      READ (N5,142) A1,A2,A3
      WRITE (N6,144) A1,A2,A3
  144 FORMAT (3F10.1)
  580 CONTINUE                                                          INDA209
      NJ=0                                                              INDA210
C                                                                       INDA211
C                                       READ CARDS FOR                  INDA212
C                                       NODAL INFORMATION               INDA213
C                                                                       INDA214
      DO 620 I=1,100                                                    INDA215
      READ(N5,166) J,HEAD,SURF,QF1,QF2,DT,CF,X1,Y1                      INDA216
  166 FORMAT(I5,F5.0,-6PF10.0,0P2F5.0,2F10.0,20X,-3P2F5.0)              INDA217
      IF(J.GT.100)GO TO 640                                             INDA218
      IF(J.GT.NJ)NJ=J                                                   INDA219
      H(J)=HEAD                                                         INDA220
      AS(J)=SURF                                                        INDA221
      QIN(J)=QF1                                                        INDA222
      QINST(J)=QF1                                                      INDA223
      QOU(J)=QF2                                                        INDA224
      X(J)=X1                                                           INDA225
      Y(J)=Y1                                                           INDA226
      DEP(J)=DT                                                         INDA227
      COF(J)=CF                                                         INDA228
  620 CONTINUE                                                          INDA229
  640 CONTINUE                                                          INDA230
      NC=0                                                              INDA231
C                                                                       INDA232
C                                       READ CARDS FOR                  INDA233
```

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C                                   CHANNEL INFORMATION                    INDA234
C                                                                          INDA235
      DO 660 I=1,225                                                       INDA236
      READ(N5,172)N,(NTEMP(K),K=1,4),ALEN,WIDTH,RAD,COEF,VEL               INDA237
  172 FORMAT(5I5,5F10.0)                                                   INDA238
      IF (N.GT.225) GO TO 670                                              INDA239
      IF(NTEMP(3).NE.0) GO TO 655                                          INDA240
      NC=NC+1                                                              INDA241
      N=NC                                                                 INDA242
      LEN(N)=ALEN                                                          INDA243
      B(N)=WIDTH                                                           INDA244
      A(N)=RAD*WIDTH                                                       INDA245
      R(N)=RAD                                                             INDA246
      AK(N)=CCEF                                                           INDA247
      V(N)=VEL                                                             INDA248
      NJUNC(N,1)=MINO(NTEMP(1),NTEMP(2))                                   INDA249
      NJUNC(N,2)=MAXO(NTEMP(1),NTEMP(2))                                   INDA250
      K=NJUNC(N,1)                                                         INDA251
      DO 643 J=1,8                                                         INDA252
      IF(IPOINT(K,J).EQ.NJUNC(N,2))GO TO 648                               INDA253
      IF(IPOINT(K,J).EQ.0) GO TO 646                                       INDA254
  643 CONTINUE                                                             INDA255
  646 IPOINT(K,J)=NJUNC(N,2)                                               INDA256
      NCHAN(K,J)=NC                                                        INDA257
      GO TO 660                                                            INDA258
  648 NC=NC-1                                                              INDA259
      M=NCHAN(K,J)                                                         INDA260
      LEN(M)=ALEN                                                          INDA261
      B(M)=B(M)+WIDTH                                                      INDA262
      R(M)=RAD                                                             INDA263
      A(M)=R(M)*B(M)                                                       INDA264
      AK(M)=CCEF                                                           INDA265
      V(M)=VEL                                                             INDA266
      GO TO 660                                                            INDA267
  655 CALL TRIAN(NTEMP(1),NTEMP(2),NTEMP(3),NTEMP(4))                      INDA268
  660 CONTINUE                                                             INDA269
  670 CONTINUE                                                             INDA270
      IF (ISWCH(2).EQ.1) GO TO 674                                         INDA271
      WRITE(N6,170)                                                        INDA272
  170 FORMAT(1H8H1CHANNEL    LENGTH   WIDTH     AREA    MANNING    VELOCITINDA273
     1Y   HYD RADIUS            JUNCTIONS AT ENDS     MAX INT /        67H INDA274
     2 NUMBER      (FT)      (FT)    (SQ FT)   COEF.      (FPS)         (FT)INDA275
     3 /)                                                                  INDA276
  674 CONTINUE                                                             INDA277
      DO 695 N=1,NC                                                        INDA278
      IF (AK(N).LE.0.0) AK(N)=0.018                                        INDA279
      IF(B(N).GT.0.) GO TO 683                                             INDA280
      K=NJUNC(N,1)                                                         INDA281
      NJUNC(N,1)=0                                                         INDA282
      IDEL=0                                                               INDA283
      DO 682 J=1,8                                                         INDA284
      IF(IPOINT(K,J).EQ.0) GO TO 682                                       INDA285
      IF(IPOINT(K,J).NE.NJUNC(N,2)) GO TO 681                              INDA286
      WRITE(N6,168) N,K,NJUNC(N,2)                                         INDA287
  168 FORMAT (8H CHANNEL,I4,8H JOINING,I4,4H AND,I4,38H DELETED DUE TO ZINDA288
     1ERO OR NEGATIVE WIDTH)                                               INDA289
      NCHAN(K,J)=0                                                         INDA290
      IPOINT(K,J)=0                                                        INDA291
      NJUNC(N,2)=0                                                         INDA292
      GO TO 695                                                            INDA293
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  681 CONTINUE                                                          INDA294
  682 CONTINUE                                                          INDA295
  683 CONTINUE                                                          INDA296
      K=NJUNC(N,2)                                                      INDA297
      DO 684 J=1,8                                                      INDA298
      IF(IPOINT(K,J).EQ.NJUNC(N,1)) GO TO 687                           INDA299
      IF(IPOINT(K,J).EQ.0) GO TO 685                                    INDA300
  684 CONTINUE                                                          INDA301
  685 CONTINUE                                                          INDA302
      IPOINT(K,J)=NJUNC(N,1)                                            INDA303
      NCHAN(K,J)=N                                                      INDA304
  687 CONTINUE                                                          INDA305
      NUMCH(N)=NJUNC(N,2)+NJUNC(N,1)*1000                               INDA306
      DO 688 J=1,NCPRT                                                  INDA307
      IF(CPRT(J).NE.NUMCH(N)) GO TO 688                                 INDA308
      CPRT(J)=N                                                         INDA309
      GO TO 690                                                         INDA310
  688 CONTINUE                                                          INDA311
  690 CONTINUE                                                          INDA312
      TF=1000.                                                          INDA313
      IF (R(N).GT.-2.) TF=0.75*LEN(N)/SQRT(32.2*(R(N)+2.))              INDA314T
      XMK=BLANK                                                         INDA315
      IF(TF.LT.DELT) XMK=ASTERK                                         INDA316
      IF(ISWCH(2).EQ.1) GO TO 695                                       INDA317
      WRITE(N6,174)  N,LEN(N),B(N),A(N),AK(N),V(N),R(N),(NJUNC(N,K),    INDA318
     1 K=1,2),TF,XMK                                                    INDA319
  174 FORMAT(I5,F11.0,F8.0,-3PF10.0,0PF9.3,F10.2,F13.1,I19,I6,F16.0,1X, INDA320
     1A4)                                                               INDA321
  695 CONTINUE                                                          INDA322
      IF (ISWCH(2).EQ.1) GO TO 698                                      INDA323
      WRITE(N6,182)                                                     INDA324
  182 FORMAT(124H1JUNCTION    INITIAL HEAD   SURFACE AREA    INPUT    OUTINDA325
     1PUT             CHANNELS ENTERING JUNCTION                 COORDINAINDA326
     2TES/122H  NUMBER         (FT)        (10**6 SQ FT)   (CFS)     (CFS)INDA327
     3                                                        X        Y/)INDA328
      ATOT=0.                                                           INDA329
      DO 696 J=1,NJ                                                     INDA330
      ATOT=ATOT+AS(J)                                                   INDA331
      WRITE(N6,184) J,HEAD,AS(J),QIN(J),QOU(J),(NCHAN(J,K),K=1,8),      INDA332
     1 X(J),Y(J)                                                        INDA333
  184 FORMAT(I7,F13.2,-6PF15.2,0P2F10.0,I10,7I6,-3PF10.1,F7.1)          INDA334
  696 CONTINUE                                                          INDA335
      WRITE(6,190) ATOT                                                 INDA336
  190 FORMAT(E20.6)                                                     INDA337
  698 CONTINUE                                                          INDA338
      WRITE (N6,192) TITLE                                              INDA339
  192 FORMAT (1H015A4,15A4)                                             INDA340
C                                                                       INDA341
C                                     STORE SYSTEM DATA ON QUALITY      INDA342
C                                     OUTPUT TAPE                       INDA343
C                                                                       INDA344
      WRITE (N20) TITLE,ALPHA,NJ,NC,NQCYC,DELTQ,((NCHAN(J,K),K=1,8),    INDA345
     1 AS(J),J=1,NJ),(LEN(N),(NJUNC(N,K),K=1,2),N=1,NC)                 INDA346
      RETURN                                                            INDA347
      END                                                               INDA348
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```
      SUBROUTINE INQUAL                                                 INQU  1
C                                                                       INQU  2
C                                     INPUT DATA SUBROUTINE             INQU  3
C                                                                       INQU  4
C                                                                       INQU  5
C                                     SPECIFICATION STATEMENTS          INQU  6
C                                                                       INQU  7
C                                     GENERAL AND CONTROL               INQU  8
C                                                                       INQU  9
      COMMON /TAPES/ INCNT,IOUTCT,JIN(10),JOUT(10),NSCRAT(5)            INQU 10
C                                                                       INQU 11
C                                                                       INQU 12
      COMMON JGW,NTC,NQCYC,DELTQ,QE,QF,ALPHA(30),TITLSW(30),ICOL(10)    INQU 13
     1 ,ISWCH(10),REAER(6),DECAY(6),AR(6),AME(6),XMF(6),XMED(6)         INQU 14
     2 ,N5,N6,N10,N20,N30,N40,NSTART,XRQD                               INQU 15
C                                                                       INQU 16
C                                     JUNCTIONS                         INQU 17
C                                                                       INQU 18
      COMMON NJ,NCHAN(100,8),QIN(100),QOU(100),VOL(100),VOLO(100)       INQU 19
     1 ,AS(100)                                                         INQU 20
C                                                                       INQU 21
C                                     CHANNELS                          INQU 22
C                                                                       INQU 23
      COMMON NC,NJUNC(225,2),Q(225),LEN(225),U(225)                     INQU 24
C                                                                       INQU 25
C                                     STORMWATER                        INQU 26
C                                                                       INQU 27
      COMMON NJSW,JSW(20)                                               INQU 28
     1,MJSW,ISW(20),TT(2),CT(6,20,2),INSTM                              INQU 29
C                                                                       INQU 30
C                                     QUALITY                           INQU 31
C                                                                       INQU 32
      COMMON KCON,KCOND,C2(6),CS(6),ICON(6),CSAT(6),C(100,6),SJMC(100,6)INQU 33
     1 ,CMAX(100,6),CMIN(100,6),MADD(100,6),DCDT(100,6),CE(6,20,2)      INQU 34
     2 ,TE( 6),TEP( 6),SLOPE(20),CSPIN(100,6),TITLE(6,6),TEU(6)         INQU 35
C                                                                       INQU 36
C                                     PRINTING                          INQU 37
C                                                                       INQU 38
      COMMON NCPRT,ITCPRT,LQCPRT,NSTPRT,NQCTOT,ISKIP,MSTPRT,NPRT,KPRT   INQU 39
C                                                                       INQU 40
      DATA DISOXY /4H(DO) /                                             INQU 41
C                                                                       INQU 42
      REAL MADD,LEN                                                     INQU 43
C                                                                       INQU 44
      N5=5                                                              INQU 45
      N6=6                                                              INQU 46
C                                                                       INQU 47
C                                     READ N10,N30,N40  N10 SHOULD BE   INQU 48
C                                     DRUM OR DISC STORAGE, N30 AND     INQU 49
C                                     N40 SHOULD BE MAGNETIC TAPE       INQU 50
C                                     IF USED.                          INQU 51
C                                                                       INQU 52
      N10 = NSCRAT(2)                                                   INQU 53
      N30 = NSCRAT(3)                                                   INQU 54
      N40 = NSCRAT(4)                                                   INQU 55
      REWIND N10                                                        INQU 56
      REWIND N20                                                        INQU 57
C                                                                       INQU 58
C                                     READ - - ISWCH VALUES             INQU 59
C                                                                       INQU 60
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C                                       IF THE SWITCH VALUE IS 1, THEN  INQJ 61
C                                       THE STATEMENT OF ACTION         INQU 62
C                                       CONTROLLED BY THE SWITCH WILL   INQJ 63
C                                       OCCUR.                          INQU 64
C                                                                       INQU 65
C                                       SWITCH 1 - INPUT INITIAL CONCEN-INQJ 66
C                                       TRATIONS FROM TAPE N30.         INQU 67
C                                       SWITCH 2 - SKIP PRINTING MAXIMUMINQJ 68
C                                       AND MINIMUM CONCENTRATIONS      INQJ 69
C                                       SWITCH 3 - WRITE CONCENTRATIONS INQU 70
C                                       ON TAPE N40 FOR A RESTART.      INQJ 71
C                                       (ALSO WRITES HYDRAULIC INFORMA- INQJ 72
C                                       TION)                           INQU 73
C                                       SWITCH 4 - BOD/DO IS AT LEAST   INQU 74
C                                       ONE OF THE CONSTITUENTS.        INQU 75
C                                       SWITCH 5 - RECEIVING WATER IS   INQJ 76
C                                       TIDALLY INFLUENCED.             INQU 77
C                                       SWITCH 10 - THIS SWITCH IS SET  INQJ 78
C                                       BY N30 IF A RESTART TAPE IS USEDINQJ 79
C                                       OR IT CAN BE READ IN IF THE     INQU 80
C                                       FIRST TIDAL CYCLE ONLY IS       INQJ 81
C                                       REPEATED                        INQU 82
C                                                                       INQJ 83
      READ(5,555) ISWCH                                                 INQU 84
  555 FORMAT (10I5)                                                     INQU 85
      IF(ISWCH(1).EQ.1) REWIND N30                                      INQJ 86
      IF(ISWCH(3).EQ.1) REWIND N40                                      INQU 87
      DO 11 I=1,10                                                      INQU 88
   11 ICOL(I)=I                                                         INQU 89
      WRITE(6,6) ICOL,ISWCH                                             INQJ 90
    6 FORMAT('1SWITCH SETTINGS'/(10I10))                                INQU 91
C                                                                       INQU 92
C                                       INITIALIZATION                  INQU 93
C                                                                       INQJ 94
      DO 5100 I=1,6                                                     INQU 95
      ICON(I)=0                                                         INQU 96
      DECAY(I)=0.0                                                      INQU 97
      CS(I)=C.C                                                         INQU 98
      CSAT(I)=0.0                                                       INQJ 99
      REAER(I)=0.0                                                      INQU100
      DO 5090 J=1,100                                                   INQJ101
      C(J,I)=0.0                                                        INQU102
      MADD(J,I) =0.0                                                    INQJ103
 5090 CONTINUE                                                          INQU104
 5100 CONTINUE                                                          INQU105
      DO 5150 I=1,6                                                     INQJ106
      TE(I) =0.0                                                        INQU107
      TEP(I)=0.0                                                        INQJ108
      DO 5140 L=1,20                                                    INQU109
      CE(I,L,1)=0.0                                                     INQU110
      CE(I,L,2)=0.0                                                     INQJ111
 5140 CONTINUE                                                          INQU112
 5150 CONTINUE                                                          INQJ113
C                                                                       INQJ114
C                                       SYSTEM DATA IS READ FROM        INQU115
C                                       RECEIVING WATER QUANTITY PROGRAMINQJ116
C                                                                       INQJ117
      READ (N2C) TITLSW,ALPHA,NJ,NC,NQCYC,DELTQ,((NCHAN(J,K),K=1,8),    INQU118
     1 AS(J),J=1,NJ),(LEN(N),(NJUNC(N,K),K=1,2),N=1,NC)                 INQU119
C                                                                       INQU120
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C                                                                       INQU121
C                                       FLOW INFORMATION IS TRANSFERRED INQU122
C                                       TO FAST STORAGE, DRUM OR DISC.  INQU123
C                                                                       INQU124
      DO 90 I=1,NQCYC                                                   INQU125
      READ(N20) NQ,(Q(N),U(N),N=1,NC),(VOL(J),QIN(J),QOU(J),J=1,NJ)     INQU126
   90 WRITE(N10) NQ,(Q(N),U(N),N=1,NC),(VOL(J),QIN(J),QOU(J),J=1,NJ)    INQU127
      REWIND N10                                                        INQU128
C                                                                       INQU129
C                                       RESTART OPTION - ALL DATA READ  INQU130
C                                       FROM TAPE N30.                  INQU131
C                                                                       INQU132
      IF(ISWCH(1).NE.1) GO TO 95                                        INQU133
      ISWCH(10) = 1                                                     INQU134
      READ  (N30) JGW,KCON,KCONO,NTC,NPRT,NJSW,TITLE,C2,CS,ICON,CSAT,   INQU135
     1 REAER,DECAY,XR,XME,XMF,XMEO,(VOLO(J),(C(J,K),SUM(J,K),           INQU136
     2 MADD(J,K),          CMAX(J,K),CMIN(J,K),K=1,KCON),J=1,NJ)       INQU137
      DO 4285 I=1,NQCYC                                                 INQU138
      READ(N30) NQ,(Q(N),U(N),N=1,NC),(VOL(J),QIN(J),QOU(J),J=1,NJ)     INQU139
 4285 WRITE(N10) NQ,(C(N),U(N),N=1,NC),(VOL(J),QIN(J),QOU(J),J=1,NJ)    INQU140
      REWIND N30                                                        INQU141
      REWIND N10                                                        INQU142
      KPRT=NTC                                                          INQU143
      NSTART=NTC+1                                                      INQU144
C                                                                       INQU145
C                                       THIS IS A READ ONLY ON RESTART  INQU146
C                                                                       INQU147
      READ (5,556) NTC                                                  INQU148
      WRITE (6,1105) NTC                                                INQU149
      GO TO 39                                                          INQU150
   95 CONTINUE                                                          INQU151
C                                                                       INQU152
C                                       NJSW - NUMBER OF STORM WATER    INQU153
C                                       INPUT JUNCTIONS.                INQU154
C                                                                       INQU155
C                                       ITCPRT - DAY CYCLE FOR START    INQU156
C                                       OF DETAILED QUALITY CYCLE       INQU157
C                                       PRINTED INFORMATION.            INQU158
C                                                                       INQU159
C                                       NQPRT - QUALITY CYCLE INCREMENT INQU160
C                                       BETWEEN PRINTED CYCLES.         INQU161
C                                                                       INQU162
C                                       LQCPRT - TOTAL NUMBER OF QUALITYINQU163
C                                       CYCLES PRINTED (PRESENTLY       INQU164
C                                       LIMITED TO 50)                  INQU165
C                                                                       INQU166
C                                                                       INQU167
C                                       READ PRINT INFORMATION FOR      INQU168
C                                       DETAILED QUALITY PRINTING.      INQU169
C                                                                       INQU170
      READ (N5,555) NJSW,ITCPRT,NQPRT,LQCPRT                            INQU171
      WRITE (N6,4100) TITLSW                                            INQU172
 4100 FORMAT(1H1,15A4,15A4)                                             INQU173
      WRITE (6,101) ALPHA                                               INQU174
  101 FORMAT(1HC,15A4,36X,32H WATER RESOURCES ENGINEERS, INC.//         INQU175
     1       1H ,15A4,36X,25H WALNUT CREEK, CALIFORNIA/                 INQU176
     2       1H      96X,' DYNAMIC STORM WATER QUALITY  '///)           INQU177
C                                                                       INQU178
C                                       READ GENERAL CONTROL PARAMETERS INQU179
C                                       AND DATA.                       INQU180
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C                                                                       INQU181
      READ (N5,556) NTC,KCON,NPRT,XRQD                                  INQU182
  556 FORMAT (3I5,F5.0)                                                 INQU183
      WRITE (6,1100) NJ                                                 INQU184
 1100 FORMAT (24HOMAXIMUM JUNCTION NUMBER,I5)                           INQU185
      WRITE (6,1102) NC                                                 INQU186
 1102 FORMAT (23HOMAXIMUM CHANNEL NUMBER,I5)                            INQU187
      WRITE (6,1104) NQCYC                                              INQU188
 1104 FORMAT (33HONUMBER OF QUALITY CYCLES PER DAY,I5)                  INQU189
      WRITE (6,1105) NTC                                                INQU190
 1105 FORMAT(15HONUMBER OF DAYS,I5)                                     INQU191
      WRITE (6,1101) KCON                                               INQU192
 1101 FORMAT(23HONUMBER OF CONSTITUENTS,I4)                             INQU193
      WRITE (6,1106) DELTQ                                              INQU194
 1106 FORMAT(45HOLENGTH OF QUALITY INTEGRATION STEP (SECONDS),F7.0)     INQU195
      WRITE (6,1110) NPRT                                               INQU196
 1110 FORMAT (16HOPRINT INTERVAL,,I4,5H DAYS)                           INQU197
      WRITE (6,1112) XRQD                                               INQU198
 1112 FORMAT(3CHOEXCHANGE REQUIREMENT AT OCEAN,F7.2)                    INQU199
      WRITE (N6,4200) NJSW                                              INQU200
 4200 FORMAT(10HOTHERE ARE,I3,27H STORMWATER INPUT JUNCTIONS)           INQU201
      MTOTAL = LQCPRT*NQPRT                                             INQU202
      WRITE (N6,5040) ITCPRT,NQPRT,MTOTAL                               INQU203
 5040 FORMAT (6CHOQUALITY CYCLE CONCENTRATIONS, PRINTOUT STARTS IN TIME INQU204
     1CYCLE,I3,16H , PRINTED EVERY,I3,25H  HOUR(S), FOR A TOTAL OF,I3,6HINQU205
     2 HOURS)                                                           INQU206
C                                                                       INQU207
C                                     READ QUALITY BOUNDARY DATA        INQU208
C                                     KCOND IS NUMBER OF CONSTITUENTS   INQU209
C                                                                       INQU210
      KCOND=KCCN                                                        INQU211
      DO 103 KC=1,KCOND                                                 INQU212
      READ (5,9) JGW,CS(KC),CSAT(KC),REAER(KC),DECAY(KC),               INQU213
     1 (TITLE(I,KC),I=1,6)                                              INQU214
    9 FORMAT(I5,F10.0,3E5.0,5X,6A4)                                     INQU215
      WRITE (6,14) KC,(TITLE(I,KC),I=1,6),CS(KC)                        INQU216
   14 FORMAT(19H1CONSTITUENT NUMBER,I2,20X,6A4//,19H SINK CONCENTRATION,INQU217
     1F8.2)                                                             INQU218
C                                                                       INQU219
C                                                                       INQU220
C                                     CONSERVATIVE/NONCONSERVATIVE      INQU221
C                                     TAGS ARE SET UP.                  INQU222
C                                     KCON IS KCOND PLUS D.O. CONSTI-   INQU223
C                                     UENTS.                            INQU224
C                                                                       INQU225
      IF(DECAY(KC).LE.0.) GO TO 1130                                    INQU226
      KCON=KCCN+1                                                       INQU227
      ICON(KC)=KCCN                                                     INQU228
      IC=ICON(KC)                                                       INQU229
      WRITE (6,1113) CSAT(KC)                                           INQU230
 1113 FORMAT(24HOOXYGEN SATURATION (MGL),F6.2)                          INQU231
      WRITE (6,1114) REAER(KC)                                          INQU232
 1114 FORMAT(37HOREAERATION COEFFICIENT (1/SQ FT/DAY),E10.3)            INQU233
      REAER(KC)=REAER(KC)*DELTQ/86400.                                  INQU234
      WRITE (6,1115) DECAY(KC)                                          INQU235
 1115 FORMAT(26HODECAY COEFFICIENT (1/DAY),F6.2)                        INQU236
      DECAY(KC)=DECAY(KC)*DELTQ/86400.                                  INQU237
      WRITE (6,1116) IC                                                 INQU238
 1116 FORMAT(53HODISSOLVED OXYGEN FOR THIS CONSTITUENT IS CONSTITUENT,  INQU239
     1 I2)                                                              INQU240
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      DO 1117 I=1,5                                                    INQU241
 1117 TITLE(I,IC)=TITLE(I,KC)                                          INQU242
      TITLE(6,IC) = DISOXY                                             INQU243
      C1(IC)=CSAT(KC)                                                  INQU244
      C2(IC)=CSAT(KC)                                                  INQU245
      DO 1120 J=1,NJ                                                   INQU246
      C(J,IC)=CSAT(KC)                                                 INQU247
      IF(NCHAN(J,1).EQ.0) C(J,IC)=0.                                   INQU248
 1120 MADD(J,IC)=CSAT(KC)                                              INQU249
 1130 CONTINUE                                                         INQU250
C                                                                      INQU251
C                                    READ IN JUNCTION DATA             INQU252
C                                                                      INQU253
      DO 102 J=1,100                                                   INQU254
      READ (5,1220) JTT,CTT,CPP,CTTOX,CPPOX                            INQU255
 1220 FORMAT(I5,4F10.0)                                                INQU256
      IF (JTT.GT.100) GO TO 1021                                       INQU257
      C(JTT,KC)=CTT                                                    INQU258
      MADD(JTT,KC)=CPP                                                 INQU259
      IF(ICON(KC).EQ.0) GO TO 102                                      INQU260
      C(JTT,IC)=CTTOX                                                  INQU261
      MADD(JTT,IC)=CPPOX                                               INQU262
  102 CONTINUE                                                         INQU263
 1021 CONTINUE                                                         INQU264
C                                                                      INQU265
C                                  PRINT WATER QUALITY ARRAYS          INQU266
C                                                                      INQU267
      WRITE (6,3050) ICOL                                              INQU268
 3050 FORMAT(1H0,34X,42H INITIAL CONCENTRATIONS (MGL), BY JUNCTION,//  INQU269
     1 9X,10I10/,11H   JUNCTION)                                       INQU270
      DO 3060 I=1,NJ,10                                                INQU271
      L=MINO(I+9,NJ)                                                   INQU272
 3060 WRITE (6,111) I,L,(C(J,KC),J=I,L)                                INQU273
  111 FORMAT(I4,5H  TC ,I3,1X,10E10.4)                                 INQU274
      WRITE (6,3070) ICOL                                              INQU275
 3070 FORMAT(1H0,33X,49H MASS LOADINGS (MILLIONS OF LBS/DAY), BY JUNCTIONQU276
     1N,/9X,10I10/,11H   JUNCTION)                                     INQU277
      DO 3080 I=1,NJ,10                                                INQU278
      L=MINO(I+9,NJ)                                                   INQU279
 3080 WRITE (6,2111) I,L,(MADD(J,KC),J=I,L)                            INQU280
 2111 FORMAT (I4,' TO 'I3,1X,-6P10F10.3)                               INQU281
      IF(ICON(KC).EQ.0) GO TO 1040                                     INQU282
      WRITE (6,3100) ICOL                                              INQU283
 3100 FORMAT(1H1,20X,59H INITIAL DISSOLVED OXYGEN CONCENTRATIONS (MGL), INQU284
     1BY JUNCTION,//9X,10I10/,11H   JUNCTION)                          INQU285
      DO 3110 I=1,NJ,10                                                INQU286
      L=MINO(I+9,NJ)                                                   INQU287
 3110 WRITE (6,111) I,L,(C(J,IC),J=I,L)                                INQU288
      WRITE (6,3120) ICOL                                              INQU289
 3120 FORMAT(1H0,20X,57H DISSOLVED OXYGEN CONCENTRATION OF INFLOW (MGL),INQU290
     1 JUNCTION,//9X,10I10/,11H   JUNCTION)                            INQU291
      DO 3130 I=1,NJ,10                                                INQU292
      L=MINO(I+9,NJ)                                                   INQU293
 3130 WRITE (6,111) I,L,(MADD(J,IC),J=I,L)                             INQU294
 1040 C2(KC)=C(1,KC)                                                   INQU295
  103 CONTINUE                                                         INQU296
C                                                                      INQU297
C                                    INITIALIZATION AND EVALUATION     INQU298
C                                    OF CONSTANTS                      INQU299
C                                                                      INQU300
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      IF(ISWCH(4).NE.1) GO TO 2290                                      INQU301
C                                                                       INQU302
C                                       THIS FOUR CARD SEGMENT IS       INQU303
C                                       FOR BOD-DO                      INQU304
C                                                                       INQU305
      KSTART=KCONC+1                                                    INQU306
      DO 229 KC=KSTART,KCON                                             INQU307
      DO 229 J=1,NJ                                                     INQU308
  229 MADD(J,KC)=MADD(J,KC)*QIN(J)                                      INQU309
 2290 CONTINUE                                                          INQU310
C                                                                       INQU311
C                                       READ AND INITIALIZE STORMWATER  INQU312
C                                       INPUT CONCENTRATIONS.           INQU313
C                                                                       INQU314
C                                       READ STORMWATER JUNCTION NUMBERSINQU315
      IF(NJSW.EQ.0) GO TO 4370                                          INQU316
      READ (N5,4280) (JSW(L),L=1,NJSW)                                  INQU317
 4280 FORMAT (1615)                                                     INQU318
      DO 4300 K=1,KCONO                                                 INQU319
C                                                                       INQU320
C                                       READ TIME AND LOADING RATE      INQU321
C                                                                       INQU322
      READ (N5,4320) TE(K),(CE(K,L,2), L=1,NJSW)                        INQU323
 4320 FORMAT (8F10.0)                                                   INQU324
      TEP(K) = TE(K)/3600.                                              INQU325
 4300 CONTINUE                                                          INQU326
      TIME = 0.0                                                        INQU327
      DO 4360 K =1,KCONO                                                INQU328
      WRITE (N6,4380) K, TEP(K)                                         INQU329
      DO 4360 L =1,NJSW                                                 INQU330
      WRITE (N6,4340) JSW(L),CE(K,L,2)                                  INQU331
 4380 FORMAT(1H010X,19H CONSTITUENT NUMBER,I5,5H AT  ,F5.2,17H HOURS FROINQU332
     1M START/)                                                         INQU333
 4340 FORMAT(1H 10X,I5,10E10.4)                                         INQU334
 4360 CONTINUE                                                          INQU335
 4370 CONTINUE                                                          INQU336
      NSTART = 1                                                        INQU337
      KPRT = 1                                                          INQU338
C                                                                       INQU339
C                                       NQCTOT AND ISKIP ARE COUNTERS   INQU340
C                                       FOR QUALITY CYCLE, JUNCTION     INQU341
C                                       CONCENTRATION PRINTOUT.         INQU342
C                                                                       INQU343
      NQCTOT = 1                                                        INQU344
      ISKIP = 1                                                         INQU345
      DO 230 J=1,NJ                                                     INQU346
      VOLO(J)=VOL(J)                                                    INQU347
      DO 2301 KC = 1,KCONO                                              INQU348
 2301 MADD(J,KC)=MADD(J,KC)*0.1857                                      INQU349
      DO 230 KC = 1,KCON                                                INQU350
      CSPIN(J,KC)=MADD(J,KC)                                            INQU351
      SUMC(J,KC)=0.5*C(J,KC)                                            INQU352
      CMAX(J,KC)=0.                                                     INQU353
  230 CMIN(J,KC)=C(J,KC)                                                INQU354
   39 CONTINUE                                                          INQU355
      RETURN                                                            INQU356
      END                                                               INQU357
```

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      SUBROUTINE LOOPCL                                                 LOOP  1
C                                                                       LOOP  2
C                                       QUALITY CYCLE LOOP              LOOP  3
C                                                                       LOOP  4
C                                                                       LOOP  5
C                                       SPECIFICATION STATEMENTS        LOOP  6
C                                                                       LOOP  7
C                                       GENERAL AND CONTROL             LOOP  8
C                                                                       LOOP  9
      COMMON /TAPES/ INCNT,IOUTCT,JIN(10),JOUT(10)                      LOOP 10
      COMMON JGW,NTC,NQCYC,DELTQ,QE,QF,ALPHA(30),TITLSW(30),ICOL(10)    LOOP 11
     1 ,ISWCH(10),REAER(6),DECAY(6),XR(6),XME(6),XMF(6),XMEO(6)         LOOP 12
     2 ,N5,N6,N10,N20,N30,N40,NSTART,XRQD                               LOOP 13
C                                                                       LOOP 14
C                                       JUNCTIONS                       LOOP 15
C                                                                       LOOP 16
      COMMON NJ,NCHAN(100,8),QIN(100),QOU(100),VOL(100),VOLO(100)       LOOP 17
     1 ,AS(100)                                                         LOOP 18
C                                                                       LOOP 19
C                                       CHANNELS                        LOOP 20
C                                                                       LOOP 21
      COMMON NC,NJUNC(225,2),Q(225),LEN(225),U(225)                     LOOP 22
C                                                                       LOOP 23
C                                       STORMWATER                      LOOP 24
C                                                                       LOOP 25
      COMMON NJSW,JSW(20)                                               LOOP 26
     1,MJSW,JSW(20),TT(2),CT(6,20,2),INSTM                              LOOP 27
C                                                                       LOOP 28
C                                       QUALITY                         LOOP 29
C                                                                       LOOP 30
      COMMON NCON,NCONO,C2(6),CS(6),ICON(6),CSAT(6),C(100,6),SJMC(100,6)LOOP 31
     1 ,CMAX(100,6),CMIN(100,6),MADD(100,6),DCDT(100,6),CE(6,20,2)      LOOP 32
     2 ,TE( 6),TEP( 6),SLOPE(20),CSPIN(100,6),TITLE(6,6),TEO(6)         LOOP 33
C                                                                       LOOP 34
C                                       PRINTING                        LOOP 35
C                                                                       LOOP 36
      COMMON NCPRT,ITCPRT,LQCPRT,NSTPRT,NQCTOT,ISKIP,MSTPRT,VPRT,KPRT   LOOP 37
      COMMON /ST1/ TITEL(40)                                            LOOP 38
C                                                                       LOOP 39
C                                                                       LOOP 40
      REAL MADD,LEN                                                     LOOP 41
C                                                                       LOOP 42
C                                                                       LOOP 43
      IF(INSTM.LT.1) IFLG=0                                             LOOP 44
      IF(INSTM.NE.1) GO TO 190                                          LOOP 45
      N21=JIN(INCNT)                                                    LOOP 46
      IF(N21.EQ.0) GO TO 190                                            LOOP 47
      REWIND N21                                                        LOOP 48
      READ (N21) TITEL                                                  LOOP 49
      WRITE (6,7093) TITEL                                              LOOP 50
 7093 FORMAT(1H1,20A4)                                                  LOOP 51
      READ(N21) NSTEPS,MJSW,NCON ,TDELT,TZERO,TAREA                     LOOP 52X
      TZ=TZERO/3600.                                                    LOOP 53
      WRITE(6,7091) NSTEPS,MJSW,NCON,TDELT,TZ,TAREA                     LOOP 54X
 7091 FORMAT(1H0,' DATA TRANSMITTED FROM INPUT FILE'/                   LOOP 55
     1' NUMBER OF STEPS                =',I5/                         LOOP 56
     2' NUMBER OF INPUT POINTS         =',I5/                         LOOP 57
     3' NUMBER OF CONSTITUENTS         =',I5/                         LOOP 58
     4' TIME INCREMENT                 =',F8.0,' SECS'/               LOOP 59
     5' INITIAL TIME                   =',F10.2,' HRS'/               LOOP 60X
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     6' TOTAL AREA                    ='F10.2,' ACREA')                    LOOP 60A
      READ(N21) (ISW(L),L=1,MJSW)                                          LOOP 61
      WRITE (6,6501) (ISW(L),L=1,MJSW)                                     LOOP 63
 6501 FORMAT(1H0,'INPUT POINTS ARE LISTED BELOW',/(10X,10I10))             LOOP 64
      READ(N21) TT(1),(D,L=1,MJSW),((CT(K,L,1),K=1,NCON),L=1,MJSW)        LOOP 65
      TH=TT(1)/3600.                                                       LOOP 67
      WRITE(6,6503)                                                        LOOP 68
 6503 FORMAT(1H0,' LOADINGS FROM DATA FILE'//7X,'TIME BOD LBS/MIN SS LBSLOOP 69
     1/MIN')                                                               LOOP 70
      WRITE(6,6502) TH,((CT(K,L,1),K=1,NCON),L=1,MJSW)                     LOOP 71
 6502 FORMAT(F12.2,10F11.3)                                                LOOP 72
      READ(N21) TT(2),(D,L=1,MJSW),((CT(K,L,2),K=1,NCON),L=1,MJSW)        LOOP 73
      TH=TT(2)/3600.                                                       LOOP 75
      WRITE(6,6502) TH,((CT(K,L,2),K=1,NCON),L=1,MJSW)                     LOOP 76
      NINREC=2                                                             LOOP 77
      I1=1                                                                 LOOP 78
      I2=2                                                                 LOOP 79
      TIME=TZERO                                                           LOOP 80
      TTP=TIME                                                             LOOP 81
  190 CONTINUE                                                             LOOP 82
C                                       MAIN LOOP                          LOOP 83
C                                                                          LOOP 84
      DO 548 ICYC=1,NCCYC                                                  LOOP 85
      MSTPRT=ICYC                                                          LOOP 86
C                                                                          LOOP 87
C                                       READ HYDRAULIC INFORMATION FROM    LOOP 88
C                                       FAST DRUM(DISC)                    LOOP 89
C                                                                          LOOP 90
      READ(N10) NQ,(Q(N),U(N),N=1,NC),(VOL(J),QIN(J),QOU(J),J=1,NJ)        LOOP 91
      DO 200 J=1,NJ                                                        LOOP 92
      IF(QIN(J).LT.0.) QIN(J)=0.                                           LOOP 93
  200 CONTINUE                                                             LOOP 94
C                                                                          LOOP 95
C                                                                          LOOP 96
C                                       VARIABLE FLOW INTERPOLATION        LOOP 97
C                                       OR AVERAGING                       LOOP 98
C                                                                          LOOP 99
      IF(INSTM.EQ.0) GO TO 4470                                            LOOP100
      TIME=TIME+DELTQ                                                      LOOP101
      IF(N21.EQ.0) GO TO 2050                                              LOOP102
      DO 2010 L=1,MJSW                                                     LOOP103
      J=ISW(L)                                                             LOOP104
      DO 2010 K=1,NCON                                                     LOOP105
 2010 MADD(J,K)=CSPIN(J,K)*DELTQ/.1857                                     LOOP106
      WRITE(6,6503)                                                        LOOP107
 2012 IF(TIME-TT(I2)) 2040,2015,2015                                       LOOP108
 2015 DO 2020 L=1,MJSW                                                     LOOP109
      J=ISW(L)                                                             LOOP110
      DO 2020 K=1,NCON                                                     LOOP111
 2020 MADD(J,K)=MADD(J,K)+CT(K,L,I1)*(TT(I2)-TTP)                          LOOP112
      TTP=TT(I2)                                                           LOOP113
      ITEMP=I2                                                             LOOP114
      I2=I1                                                                LOOP115
      I1=ITEMP                                                             LOOP116
      IF(NINREC-NSTEPS) 2025,2030,2030                                     LOOP117
 2025 READ(N21) TT(I2),(D,L=1,MJSW),((CT(K,L,I2),K=1,NCON),L=1,MJSW)       LOOP118
      TH=TT(I2)/3600.                                                      LOOP120
      WRITE(6,6502) TH,((CT(K,L,I2),K=1,NCON),L=1,MJSW)                    LOOP121
      NINREC=NINREC+1                                                      LOOP122
      GO TO 2012                                                           LOOP123
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 2030 TT(I2)=TT(I1)+TT(I1)-TT(I2)                                        LOOP124
      DO 2035 L=1,MJSW                                                   LOOP125
      DO 2035 K=1,NCON                                                   LOOP126
 2035 CT(K,L,I2)=0.                                                      LOOP127
      GO TO 2012                                                         LOOP128
 2040 DO 2045 L=1,MJSW                                                   LOOP129
      J=ISW(L)                                                           LOOP130
      DO 2045 K=1,NCON                                                   LOOP131
 2045 MADD(J,K)=(MADD(J,K)+CT(K,L,I1)*(TIME-TTP))/DELTQ *  267.408       LOOP132
      TTP=TIME                                                           LOOP133
 2050 IF(NJSW.EQ.0) GO TO 4470                                           LOOP134
      DO 4400 K=1,KCONO                                                  LOOP135
      IF (TIME.LE.TE(K)) GO TO 4400                                      LOOP136
      TEO(K) = TE(K)                                                     LOOP137
      DO 4440 L =1,NJSW                                                  LOOP138
      CE(K,L,1) = CE(K,L,2)                                              LOOP139
 4440 CONTINUE                                                           LOOP140
C                                                                        LOOP141
C                                     READ TIME AND LOADING RATE         LOOP142
C                                                                        LOOP143
      READ (N5,4320) TE(K),(CE(K,L,2), L = 1,NJSW)                       LOOP144
 4320 FORMAT (8F10.0)                                                    LOOP145
      TEP(K) = TE(K)/3600.                                               LOOP146
      WRITE (N6,4380) K,TEP(K)                                           LOOP147
 4380 FORMAT (1H010X,42H INPUT, POUNDS PER DAY, CONSTITUENT NUMBER,I5,5HLOOP148
     1 AT  ,F6.2,17H HOURS FROM START/)                                  LOOP149
      DO 4420 L =1,NJSW                                                  LOOP150
      WRITE (N6,4340) JSW(L), CE(K,L,2)                                  LOOP151
 4340 FORMAT(1H 10X,I5,10E10.4)                                          LOOP152
 4420 CONTINUE                                                           LOOP153
 4400 CONTINUE                                                           LOOP154
      DO 4460 K=1,KCONO                                                  LOOP155
      DO 4460 L =1,NJSW                                                  LOOP156
      J = JSW(L)                                                         LOOP157
      SLOPE(L)=(CE(K,L,2)-CE(K,L,1))/(TE(K)-TEO(K))                      LOOP158
      MADD(J,K)=CSPIN(J,K)+(CE(K,L,1)+SLOPE(L)*(TIME-TEO(K)))*0.1857     LOOP159
 4460 CONTINUE                                                           LOOP160
 4470 CONTINUE                                                           LOOP161
C                                                                        LOOP162
C                                                                        LOOP163
C                                     SET BOUNDARY CONCENTRATION         LOOP164
C                                     CONDITIONS                         LOOP165
C                                                                        LOOP166
      DO 230 KC=1,KCONO                                                  LOOP167
      IC=ICON(KC)                                                        LOOP168
      IF(IFLG-1) 208,210,220                                             LOOP169
  208 DO 209 KCC=1,KCON                                                  LOOP170
      XME(KCC)=1.                                                        LOOP171
  209 XMEO(KCC)=0.                                                       LOOP172
  210 IF(QIN(JGW)) 211,211,215                                           LOOP173
  211 IF(QOU(JGW)) 215,215,221                                           LOOP174
  215 IFLG=1                                                             LOOP175
      IF(IC.EQ.0) GO TO 218                                              LOOP176
      MADD(JGW,IC)=((XRQD/XME(IC)*XMEO(IC)+CSAT(KC))*QIN(JGW))/DELTQ     LOOP177
  218 MADD(JGW,KC)=((XRQD/XME(KC)*XMEO(KC)+CS(KC)  )*QIN(JGW))/DELTQ     LOOP178
      GO TO 230                                                          LOOP179
  220 IF(QOU(JGW)) 215,215,226                                           LOOP180
  221 IFLG=2                                                             LOOP181
      DO 223 KCC=1,KCON                                                  LOOP182
      XME(KCC)=1.                                                        LOOP183
```

```
  223 XMEO(KCC)=0.                                                        LOOP184
  226 IF(IC.EQ.0) GO TO 227                                               LOOP185
      XME(IC)=XME(IC)+QOU(JGW)                                            LOOP186
      XMEO(IC)=XMEO(IC)+QOU(JGW)*(C(JGW,IC)-CSAT(KC))                     LOOP187
  227 XME(KC)=XME(KC)+QOU(JGW)                                            LOOP188
      XMEO(KC)=XMEO(KC)+QOU(JGW)*(C(JGW,KC)-CS(KC))                       LOOP189
  230 CONTINUE                                                            LOOP190
C                                                                         LOOP191
C                                                                         LOOP192
C                                        COMPUTE CONCENTRATION CHANGES    LOOP193
C                                                                         LOOP194
      DO 280 J=1,NJ                                                       LOOP195
      IF(NCHAN(J,1).EQ.0) GO TO 280                                       LOOP196
      SUMQ=0.                                                             LOOP197
      DO 245 KC=1,KCON                                                    LOOP198
  245 DCDT(J,KC)=0.                                                       LOOP199
C                                                                         LOOP200
C                                                                         LOOP201
C                                        ADVECTIVE MOVEMENT IN CHANNELS   LOOP202
C                                                                         LOOP203
      DO 260 K=1,8                                                        LOOP204
      N=NCHAN(J,K)                                                        LOOP205
      IF(N.EQ.0) GO TO 260                                                LOOP206
      JL=NJUNC(N,1)                                                       LOOP207
      JH=NJUNC(N,2)                                                       LOOP208
      IF((J.EQ.JL).AND.(Q(N).GE.0.)) GO TO 260                            LOOP209
      IF((J.EQ.JH).AND.(Q(N).LE.0.)) GO TO 260                            LOOP210
      IF((ABS(U(N)*DELTQ)).GT.LEN(N)) U(N)=SIGN(LEN(N)/DELTQ,U(N))        LOOP211
      SUMQ=SUMQ+ABS(Q(N))                                                 LOOP212
      DO 250 KC=1,KCON                                                    LOOP213
  250 DCDT(J,KC)=DCDT(J,KC)+ABS(Q(N))*(U(N)*(C(JL,KC)-C(JH,KC))/LEN(N))   LOOP214
  260 CONTINUE                                                            LOOP215
  265 CONTINUE                                                            LOOP216
      DO 270 KC=1,KCON                                                    LOOP217
      IF (SUMQ.EQ.0.) GO TO 270                                           LOOP218
      DCDT(J,KC)=(DCDT(J,KC)/SUMQ)*DELTQ                                  LOOP219
  270 CONTINUE                                                            LOOP220
  280 CONTINUE                                                            LOOP221
C                                                                         LOOP222
C                                                                         LOOP223
C                                        UPDATE CONCENTRATION AND CHECK   LOOP224
C                                        DEPLETION                        LOOP225
C                                                                         LOOP226
      DO 285 J=1,NJ                                                       LOOP227
      IF(NCHAN(J,1).EQ.0) GO TO 285                                       LOOP228
      DO 284 KC=1,KCON                                                    LOOP229
      C(J,KC)=C(J,KC)+DCDT(J,KC)                                          LOOP230
      IF(C(J,KC).LT.0.) C(J,KC)=0.                                        LOOP231
  284 CONTINUE                                                            LOOP232
  285 CONTINUE                                                            LOOP233
C                                                                         LOOP234
C                                                                         LOOP235
C                                        SOURCE CONTRIBUTION              LOOP236
C                                                                         LOOP237
      DO 289 J=1,NJ                                                       LOOP238
      IF (VOL(J) .LE. 0.0) GO TO 289                                      LOOP239
      DO 288 KC=1,KCON                                                    LOOP240
  288 C(J,KC) = C(J,KC)+(MACD(J,KC)/VOL(J))*DELTQ                         LOOP241
  289 CONTINUE                                                            LOOP242
C                                                                         LOOP243
```

```
C                                                                       LOOP244
C                                    DECAY AND REAERATION               LOOP245
C                                                                       LOOP246
      IF(ISWCH(4).NE.1) GO TO 300                                       LOOP247
      DO 295 J=1,NJ                                                     LOOP248
      IF(NCHAN(J,1).EQ.0) GO TO 295                                     LOOP249
      DO 290 KC=1,KCONO                                                 LOOP250
      IC=ICON(KC)                                                       LOOP251
      IF(IC.EQ.0) GO TO 290                                             LOOP252
      CLOSS=C(J,KC)*DECAY(KC)                                           LOOP253
      IF(CLOSS.GT.C(J,IC)) CLOSS=C(J,IC)                                LOOP254
      OGAIN=(CSAT(KC)-C(J,IC))*AS(J)*REAER(KC)                          LOOP255
      IF(OGAIN.LT.0.) OGAIN=0.                                          LOOP256
      C(J,KC)=C(J,KC)-CLOSS                                             LOOP257
      C(J,IC)=C(J,IC)-CLOSS+OGAIN                                       LOOP258
      IF(C(J,IC).GT.CSAT(KC)) C(J,IC)=CSAT(KC)                          LOOP259
      IF(C(J,IC).LT.0.) C(J,IC)=0.                                      LOOP260
  290 CONTINUE                                                          LOOP261
  295 CONTINUE                                                          LOOP262
  300 CONTINUE                                                          LOOP263
C                                                                       LOOP264
C                                                                       LOOP265
C                                    ACCUMULATE MINIMUM, MAXIMUM,       LOOP266
C                                    AND MEAN CONCENTRATIONS            LOOP267
C                                                                       LOOP268
      DO 320 J=1,NJ                                                     LOOP269
      DO 320 KC=1,KCON                                                  LOOP270
      IF(CMIN(J,KC).GT.C(J,KC)) CMIN(J,KC)=C(J,KC)                      LOOP271
      IF(CMAX(J,KC).LT.C(J,KC)) CMAX(J,KC)=C(J,KC)                      LOOP272
  320 SUMC(J,KC)=SUMC(J,KC)+C(J,KC)                                     LOOP273
      IF (NQPRT.EQ.0) GO TO 4500                                        LOOP274
      IF (NSTPRT.LT.ITQPRT) GO TO 4500                                  LOOP275
      IF (LQCPRT.LT.NQCTOT) GO TO 4500                                  LOOP276
      CALL QPRINT                                                       LOOP277
 4500 CONTINUE                                                          LOOP278
C                                                                       LOOP279
C                                                                       LOOP280
C                                    END QUALITY CYCLE LOOP             LOOP281
C                                                                       LOOP282
  548 CONTINUE                                                          LOOP283
      RETURN                                                            LOOP284
      END                                                               LOOP285
```

```
      SUBROUTINE OUTPUT(NTINT)                                          OUTP  1
C                                       OUTPUT SUBROUTINE               OUTP  2
C                                       HYDRODYNAMICS PROGRAM           OUTP  3
C                                       SPECIFICATION STATEMENTS        OUTP  4
C                                                                       OUTP  5
C                                                                       OUTP  6
C                                       CONTROL                         OUTP  7
C                                                                       OUTP  8
      COMMON /CONTR/ N5,N6,N20,N21,  NTCYC,NQCYC,NHCYC,  NT,NQSWRT      OUTP  9
     1,  DELTQ,DELT,TZERO,   ISWCH(10)                                  OUTP 10
C                                                                       OUTP 11
C                                       GENERAL                         OUTP 12
C                                                                       OUTP 13
      COMMON  ALPHA(30),  NJ,NC,   ICYC,KCYC,NCYC,   WIND,WDIR,EVAP     OUTP 14
     1,  PRECP(50),NEXIT                                                OUTP 15
C                                                                       OUTP 16
C                                       JUNCTIONS                       OUTP 17
C                                                                       OUTP 18
      COMMON  H(100),HN(100),HT(100),HBAR(100),HAVE(100)                OUTP 19
     1,  NCHAN(100,8),IPOINT(100,8),AS(100),VOL(100),X(100),Y(100)      OUTP 20
     2,  DEP(100),COF(100),CIN(100),QOU(100),QINST(100)                 OUTP 21
     3,  QINBAR(100),QOUBAR(100)                                        OUTP 22
C                                                                       OUTP 23
C                                       CHANNELS                        OUTP 24
C                                                                       OUTP 25
      COMMON LEN(225),NJUNC(225,2),B(225),R(225),A(225),AT(225),AK(225) OUTP 26
     1,   Q(225),QBAR(225),QAVE(225), V(225),VT(225),VBAR(225)          OUTP 27
     2, FWIND(225),NUMCH(225),NTEMP(8)                                  OUTP 28
     3,NCLOS(225)                                                       OUTP 29
C                                                                       OUTP 30
C                                       PRINTOUT AND PLOTTING           OUTP 31
C                                                                       OUTP 32
      COMMON   NPRT,IPRT,   NHPRT,JPRT(50),PRTH(30,50)                  OUTP 33
     1,  NQPRT,QPRT(50),PRTV(30,50),PRTQ(30,50),  IDUM(12),ICOL(10)     OUTP 34
     2,  LTIME,  NPLT,NPDEL,JPLT(50),HPLT(50)                           OUTP 35
                                                                        OUTP 36
C                                                                       OUTP 37
C                                       STAGE-TIME COEFFICIENTS         OUTP 38
C                                                                       OUTP 39
      COMMON YY(50) ,TT(50) ,AA(10),XX(10),SXX(10,10),SXY(10)           OUTP 40
     1,A1,A2,A3,A4,A5,A6,A7,PERIOD,JGW                                  OUTP 41
C                                                                       OUTP 42
C                                       STORMWATER                      OUTP 43
C                                                                       OUTP 44
      COMMON  TITLE(30),NJSW,QE(20,2),JSW(20)                           OUTP 45
     2, RAIN(100),INTIME(100),INRAIN,JBOUND(20),JJBOUN                  OUTP 46
C                                                                       OUTP 47
C                                       TAPES                           OUTP 48
      COMMON /TAPES/ INCNT,IOUTCT,JIN(10),JOUT(10),NSCRAT(5)            OUTP 49
C                                                                       OUTP 50
      COMMON /LAB/ TITL(18),XLAB(11),YLAB(6),HORIZ(20),VERT(7,5),IT     OUTP 51X
      COMMON/PLOT/T(5),NZ(5),AX(101,50),AY(101,50),NPT(50)              OUTP 52
      IF(NTINT.EQ.1) GO TO 210                                          OUTP 53
      READ(5,102) TITL                                                  OUTP 54
      READ(5,102) HORIZ                                                 OUTP 55
      IT=1                                                              OUTP 55A
      READ(5,102) (VERT(II,IT),II=1,7)                                  OUTP 56X
  102 FORMAT(20A4)                                                      OUTP 57
      RETURN                                                            OUTP 58
  210 CONTINUE                                                          OUTP 59
```

```
      DUMMY=0.                                                          OUTP  60
      TMAX=10000.                                                       OUTP  61
      N22 = JCLT(IOUTCT)                                                OUTP  62
      WRITE(N22) TMAX,(DUMMY,J=1,NPLT)                                  OUTP  63
      N=0                                                               OUTP  64
      REWIND N22                                                        OUTP  65
  220 N=N+1                                                             OUTP  66
      IF (N .GT. 101) GO TO 225                                         OUTP  67
      READ(N22) AX(N,1),(AY(N,J),J=1,NPLT)                              OUTP  68
      IF(AX(N,1).LT.1000.) GO TO 220                                    OUTP  69
  225 CONTINUE                                                          OUTP  70
      NCURVE=N-1                                                        OUTP  71
      NPTN=0                                                            OUTP  72
      N=0                                                               OUTP  73
  240 N=N+1                                                             OUTP  74
      NDC=N                                                             OUTP  75
  250 IF(JPLT(NDC).GE.0) GO TO 270                                      OUTP  76
      NDC=NDC+1                                                         OUTP  77
      GO TO 250                                                         OUTP  78
  270 CONTINUE                                                          OUTP  79
      DO 290 J=N,NDC                                                    OUTP  80
      K=J-N+1                                                           OUTP  81
      NPT(K)=NCURVE                                                     OUTP  82
      DO 290 I=1,NCURVE                                                 OUTP  83
      AX(I,K)=AX(I,1)                                                   OUTP  84
      AY(I,K)=AY(I,J)                                                   OUTP  85
  290 CONTINUE                                                          OUTP  86
      NX=NDC-N+1                                                        OUTP  87
      NPTN=NPTN+1                                                       OUTP  88
      CALL CURVE(AX,AY,NPT,NX,NPTN)                                     OUTP  89
      DO 300 J=N,NDC                                                    OUTP  90
      K=J-N+1                                                           OUTP  91
      NPT(K)=IABS(JPLT(J))                                              OUTP  92
  300 CONTINUE                                                          OUTP  93
      WRITE(6,50) (NPT(K),K=1,NX)                                       OUTP  94
   50 FORMAT(1H0,40X,20H       PLOT LEGEND  ,                           OUTP  95
     1               I5,4H = *,I5,4H = +,I5,4H = ',I5,4H = X,I5,4H = .) OUTP  96
      N=NDC                                                             OUTP  97
      IF(N.LT.NPLT) GO TO 240                                           OUTP  98
      RETURN                                                            OUTP  99
      END                                                               OUTP100
```

```
      SUBROUTINE PRTOUT                                                 PRTO  1
C                                                                       PRTO  2
C                                     PRINTING OUTPUT ROUTINE           PRTO  3
C                                                                       PRTO  4
C                                     HYDRODYNAMICS PROGRAM             PRTO  5
C                                     SPECIFICATION STATEMENTS          PRTO  6
C                                                                       PRTO  7
C                                                                       PRTO  8
C                                     CONTROL                           PRTO  9
C                                                                       PRTO 10
      COMMON /CONTR/ N5,N6,N20,N21,  NTCYC,NQCYC,NHCYC,  NT,NQSWRT      PRTO 11
     1,  DELTQ,DELT,TZERO,   ISWCH(10)                                  PRTO 12
C                                                                       PRTO 13
C                                     GENERAL                           PRTO 14
C                                                                       PRTO 15
      COMMON  ALPHA(30).  NJ,NC,   ICYC,KCYC,NCYC,   WIND,WDIR,EVAP     PRTO 16
     1,  PRECP(50),NEXIT                                                PRTO 17
C                                                                       PRTO 18
C                                     JUNCTIONS                         PRTO 19
C                                                                       PRTO 20
      COMMON  H(100),HN(100),HT(100),HBAR(100),HAVE(100)                PRTO 21
     1   NCHAN(100,8),IPOINT(100,8),AS(100),VOL(100),X(100),Y(100)      PRTO 22
     2,  DEP(100),COF(100),CIN(100),COU(100),QINST(100)                 PRTO 23
     3,  QINBAR(100),COUBAR(100)                                        PRTO 24
C                                                                       PRTO 25
C                                     CHANNELS                          PRTO 26
C                                                                       PRTO 27
      COMMON LEN(225),NJUNC(225,2),B(225),R(225),A(225),AT(225),AK(225) PRTO 28
     1,   Q(225),QBAR(225),QAVE(225), V(225),VT(225),VBAR(225)          PRTO 29
     2, FWIND(225),NUMCH(225),NTEMP(8)                                  PRTO 30
     3,NCLOS(225)                                                       PRTO 31
C                                                                       PRTO 32
C                                     PRINTOUT AND PLOTTING             PRTO 33
C                                                                       PRTO 34
      COMMON   APRT,IPRT,   NHPRT,JPRT(50),PRTH(30,50)                  PRTO 35
     1,  NQPRT,CPRT(50),PRTV(30,50),PRTQ(30,50),  IDUM(12),ICOL(10)     PRTO 36
     2,  LTIME,  NPLT,NPDEL,JPLT(50),HPLT(50)                           PRTO 37
C                                                                       PRTO 38
C                                     STAGE-TIME COEFFICIENTS           PRTO 39
C                                                                       PRTO 40
      COMMON YY(50) ,TT(50) ,AA(10),XX(10),SXX(10,10),SXY(10)           PRTO 41
     1,A1,A2,A3,A4,A5,A6,A7,PERIOD,JGW                                  PRTO 42
C                                                                       PRTO 43
C                                     STORMWATER                        PRTO 44
C                                                                       PRTO 45
      COMMON  TITLE(30),NJSW,QE(20,2),JSW(20)                           PRTO 46
     2, RAIN(100),INTIME(100),INRAIN,JBOUND(20),JJBOUN                  PRTO 47
C                                                                       PRTO 48
C                                     TAPES                             PRTO 49
C                                                                       PRTO 50
      COMMON /TAPES/ INCNT,IOUTCT,JIN(10),JOUT(10),NSCRAT(5)            PRTO 51
C                                                                       PRTO 52
C                                     TYPE DESIGNATIONS                 PRTO 53
C                                                                       PRTO 54
      INTEGER CPRT                                                      PRTO 55
      REAL LEN                                                          PRTO 56
  100 FORMAT(1H1,15A4,20X,31HWATER RESOURCES ENGINEERS, INC./1H ,15A4,20X,PRTO 57
     1,24HWALNUT CREEK, CALIFORNIA/1H  ,80X,29HRECEIVING WATER HYDRODYNAMIPRTO 58
     2CS//)                                                             PRTO 59
      DO 220 I=1,NHPRT,6                                                PRTO 60
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```
      WRITE (6,100) ALPHA                                                PRTO 61
      WRITE (N6,102) TITLE                                               PRTO 62
  102 FORMAT(1HO,30A4)                                                   PRTO 63
      WRITE (N6,104) NT                                                  PRTO 64
  104 FORMAT (7HODAY IS,I4)                                              PRTO 65
      WRITE (6,106)                                                      PRTO 66
  106 FORMAT (125HO  * * * * * * * * * * * * * * * * * * * * * * *  T I M E  PRTO 67
     1H I S T O R Y  O F  S T A G E  * * * * * * * * * * * * * * * * * * PRTO 68
     2* * *)                                                             PRTO 69
      WRITE(6,108) JPRT(I),JPRT(I+1),JPRT(I+2),JPRT(I+3),JPRT(I+4),      PRTO 70
     1 JPRT(I+5)                                                         PRTO 71
  108 FORMAT (1HO,23X,9H JUNCTION,I5,13H     JUNCTION,I5,13H     JUNCTIOPRTO 72
     1N,I5,13H     JUNCTION,I5,13H     JUNCTION,I5,13H     JUNCTION     PRTO 73
     2,I5/12H         HOUR,17X,10HHEAD(FEET)         HEAD(FEET)         HPRTO 74
     3EAD(FEET)         HEAD(FEET)         HEAD(FEET)         HEAD(FEET)/) PRTO 75
      T=TZERO-DELT*FLOAT(NHCYC)                                          PRTO 76
      LT=MINO(I+5,NHPRT)                                                 PRTO 77
      DO 220 L=1,LTIME                                                   PRTO 78
      T=T+DELT*FLOAT(NHCYC)                                              PRTO 79
      HOUR=T/3600.                                                       PRTO 80
  220 WRITE(6,110) HOUR,(PRTH(L,K),K=I,LT)                               PRTO 81
  110 FORMAT(1H ,F10.2,8X,F14.4,5F18.4)                                  PRTO 82
C                                                                        PRTO 83
C                                     PRINT FLOWS AND VELOCITIES         PRTO 84
C                                                                        PRTO 85
      DO 240 I=1,NQPRT,6                                                 PRTO 86
      WRITE (6,100) ALPHA                                                PRTO 87
      WRITE (N6,102) TITLE                                               PRTO 88
      WRITE (N6,104) NT                                                  PRTO 89
      WRITE (6,112)                                                      PRTO 90
  112 FORMAT (125HO  * * * * * * * * * * * * * * * * T I M E  H I S T O RPRTO 91
     1 Y  O F  F L O W  A N D  V E L O C I T Y  * * * * * * * * * * * * * PRTO 92
     2* * *)                                                             PRTO 93
      DO 230 IC=1,6                                                      PRTO 94
      JC=I-1+IC                                                          PRTO 95
      NX=CPRT(JC)                                                        PRTO 96
      IF(JC.GT.NCPRT)  NX=CPRT(NQPRT)                                    PRTO 96A
      IDUM(2*IC-1)= IABS(NJUNC(NX,1))                                    PRTO 97
      IDUM(2*IC)  = IABS(NJUNC(NX,2))                                    PRTO 98
  230 CONTINUE                                                           PRTO 99
      WRITE(6,114) (IDUM(IC),IC=1,12)                                    PRTO100
  114 FORMAT(1HO,18X,6(10H   CHANNEL,I3,I4)/                             PRTO101
     2,6X,114H HOUR              FLOW  VEL.       FLOW  VEL.       FLOW PRTO102
     3 VEL.       FLOW  VEL.       FLOW  VEL.       FLOW  VEL.,/,24X     PRTO103
     4 ,97H (CFS) (FPS)      (CFS) (FPS)      (CFS) (FPS)      (CFS) (FPPRTO104
     5S)      (CFS) (FPS)      (CFS) (FPS),/)                           PRTO105
      T=TZERO-DELT*FLOAT(NHCYC)                                          PRTO106
      LT=MINO(I+5,NQPRT)                                                 PRTO107
      DO 240 L=1,LTIME                                                   PRTO108
      T=T+DELT*FLOAT(NHCYC)                                              PRTO109
      HOUR=T/3600.                                                       PRTO110
  240 WRITE(6,116) HOUR,(PRTQ(L,K),PRTV(L,K),K=I,LT)                     PRTO111
  116 FORMAT (1H ,F10.2,8X,6(F10.0,F7.2))                                PRTO112
      IF (NEXIT.EQ.1) STOP 3333                                          PRTO113X
      DO 260 I = 1,NHPRT                                                 PRTO114
      PRTH(1,I) = PRTH(LTIME,I)                                          PRTO115
  260 CONTINUE                                                           PRTO116
      DO 280 I = 1,NQPRT                                                 PRTO117
      PRTQ(1,I) = PRTQ(LTIME,I)                                          PRTO118
      PRTV(1,I) = PRTV(LTIME,I)                                          PRTO119
```

```
280 CONTINUE                                                          PRTO120
    NTINT=1                                                           PRTO121
    CALL OUTPUT(NTINT)                                                PRTO122
    IF(NJSW.GT.0)                                                     PRTO123
   1WRITE(N6,118) (JSW(L),L=1,NJSW)                                   PRTO124
118 FORMAT(33H1HYDROGRAPH INPUT NODES TO SYSTEM,//(6X,10I10))         PRTO125
    RETURN                                                            PRTO126
    END                                                               PRTO127
```

```
      SUBROUTINE QPRINT                                                 QPRI   1
C                                                                       QPRI   2
C                                                                       QPRI   3
C                                     PRINT ROUTINE FOR QUALITY         QPRI   4
C                                     CYCLE OUTPUT.                     QPRI   5
C                                                                       QPRI   6
C                                     SPECIFICATION STATEMENTS          QPRI   7
C                                                                       QPRI   8
C                                     GENERAL AND CONTROL               QPRI   9
C                                                                       QPRI  10
      COMMON JGW,NTC,NQCYC,DELTQ,QE,QF,ALPHA(30),TITLSW(30),ICOL(10)    QPRI  11
     1 ,ISWCH(10),REAER(6),DECAY(6),XR(6),XME(6),XMF(6),XMEU(6)         QPRI  12
     2 ,N5,N6,N10,N20,N30,N40,NSTART,XRQD                               QPRI  13
C                                                                       QPRI  14
C                                     JUNCTIONS                         QPRI  15
C                                                                       QPRI  16
      COMMON NJ,NCHAN(100,8),QIN(100),QOU(100),VOL(100),VOLO(100)       QPRI  17
     1 ,AS(100)                                                         QPRI  18
C                                                                       QPRI  19
C                                     CHANNELS                          QPRI  20
C                                                                       QPRI  21
      COMMON NC,NJUNC(225,2),Q(225),LEN(225),U(225)                     QPRI  22
C                                                                       QPRI  23
C                                     STORMWATER                        QPRI  24
C                                                                       QPRI  25
      COMMON NJSW,JSW(20)                                               QPRI  26
     1,MJSW,ISW(20),TT(2),CT(6,20,2), INSTM                             QPRI  27
C                                                                       QPRI  28
C                                     QUALITY                           QPRI  29
C                                                                       QPRI  30
      COMMON KCON,KCOND,C2(6),CS(6),ICON(6),CSAT(6),C(100,6),SJMC(100,6)QPRI  31
     1 ,CMAX(100,6),CMIN(100,6),MADD(100,6),DCDT(100,6),CE(6,20,2)      QPRI  32
     2 ,TE( 6),TEP( 6),SLOPE(20),CSPIN(100,6),TITLE(6,6),TEU(6)         QPRI  33
C                                                                       QPRI  34
C                                     PRINTING                          QPRI  35
C                                                                       QPRI  36
      COMMON NQPRT,ITQPRT,LQCPRT,NSTPRT,NQCTOT,ISKIP,MSTPRT,NPRT,KPRT   QPRI  37
C                                                                       QPRI  38
C                                                                       QPRI  39
      REAL MADD                                                         QPRI  40
      IF (ISKIP.NE.NQPRT) GO TO 5020                                    QPRI  41
      NQCTOT = NQCTOT + 1                                               QPRI  42
 4100 FORMAT(1H0,15A4,15A4)                                             QPRI  43
      WRITE(N6,101) ALPHA                                               QPRI  44
      WRITE (N6,4100) TITLSW                                            QPRI  45
  101 FORMAT(1H1,15A4,36X,32H FWQA STORMWATER MODEL          /          QPRI  46
     1       1H ,15A4,36X,25H                                /          QPRI  47
     2       1H       96X,28H RECEIVING WATER QUALITY    //)          QPRI  48
      WRITE(N6,321) NSTPRT,MSTPRT                                       QPRI  49
  321 FORMAT(43H0JUNCTION CONCENTRATIONS, DURING TIME CYCLE,I4,15H ,QUALQPRI  50
     1ITY CYCLE,I4//)                                                   QPRI  51
      DO 322 KC=1,KCON                                                  QPRI  52
      WRITE(N6,325) KC,(TITLE(II,KC),II=1,6),ICOL                       QPRI  53
  325 FORMAT(//15X,20H  CONSTITUENT NUMBER,I3,6A4/9X,10I10/12H    JUNCTIQPRI  54
     1ON)                                                               QPRI  55
      DO 110 I=1,NJ,10                                                  QPRI  56
      L=MIN0(I+9,NJ)                                                    QPRI  57
  110 WRITE(N6,111) I,L,(C(J,KC),J=I,L)                                 QPRI  58
  111 FORMAT (I4,4H TO ,I3,1X,10F10.2)                                  QPRI  59
  322 CONTINUE                                                          QPRI  60
```

```
      ISKIP = 1                                                    QPRI 61
      GO TO 5010                                                   QPRI 62
 5020 CONTINUE                                                     QPRI 63
      ISKIP = ISKIP + 1                                            QPRI 64
 5010 CONTINUE                                                     QPRI 65
      RETURN                                                       QPRI 66
      END                                                          QPRI 67
```

```
      SUBROUTINE RECEIV                                                 RECE  1
      COMMON /TAPES/ INCNT,IOUTCT,JIN(10),JOUT(10),NSCRAT(5)            RECE  2
      DIMENSION QUAN(2),QUAL(2),ANAME(4)                                RECE  3
      DATA QUAN/4HQUAN,4HTITY/                                          RECE  4
      DATA QUAL/4HQUAL,4HITY /                                          RECE  5
      N5=5                                                              RECE  6
      N6=6                                                              RECE  7
      INCNT=INCNT+1                                                     RECE  8
      READ (N5,100) (ANAME(I),I=1,4)                                    RECE  9
  100 FORMAT(4A4,I4)                                                    RECE 10
      IF (ANAME(1).EQ.QUAN(1).AND.ANAME(2).EQ.QUAN(2)) GO TO 200        RECE 11
  150 IF(ANAME(3).EQ.QUAL(1).AND.ANAME(4).EQ.QUAL(2))GO TO 300          RECE 12
      GO TO 400                                                         RECE 13
  200 CALL SWFLOW                                                       RECE 14
      GO TO 150                                                         RECE 15
  300 CALL SWQUAL                                                       RECE 16
  400 WRITE(N6,500)                                                     RECE 17
  500 FORMAT (31HORECEIVING SIMULATION COMPLETED)                       RECE 18
      RETURN                                                            RECE 19
      END                                                               RECE 20
```

```
      SUBROUTINE SWFLOW                                                 SWFL  1
C                                       HYDRODYNAMICS PROGRAM           SWFL  2
C                                       TIDAL OPTION                    SWFL  3
C                                                                       SWFL  4
C                                       SPECIFICATION STATEMENTS        SWFL  5
C                                                                       SWFL  6
C                                                                       SWFL  7
C                                       CONTROL                         SWFL  8
C                                                                       SWFL  9
      COMMON /CONTR/ N5,N6,N20,N21,  NTCYC,NQCYC,NHCYC,  NT,NQSWRT      SWFL 10
     1,  DELTC,DELT,TZERO,   ISWCH(10)                                  SWFL 11
C                                                                       SWFL 12
C                                       GENERAL                         SWFL 13
C                                                                       SWFL 14
      COMMON  ALPHA(30),  NJ,NC,   ICYC,KCYC,NCYC,   WIND,WDIR,EVAP     SWFL 15
     1,  PRECP(50),NEXIT                                                SWFL 16
C                                                                       SWFL 17
C                                       JUNCTIONS                       SWFL 18
C                                                                       SWFL 19
      COMMON  H(100),HN(100),HT(100),HBAR(100),HAVE(100)                SWFL 20
     1,  NCHAN(100,8),IPOINT(100,8),AS(100),VOL(100),X(100),Y(100)      SWFL 21
     2,  DEP(100),COF(100),QIN(100),QOU(100),QINST(100)                 SWFL 22
     3,  QINBAR(100),COUBAR(100)                                        SWFL 23
C                                                                       SWFL 24
C                                       CHANNELS                        SWFL 25
C                                                                       SWFL 26
      COMMON LEN(225),NJUNC(225,2),B(225),R(225),A(225),AT(225),AK(225) SWFL 27
     1,   Q(225),QBAR(225),QAVE(225), V(225),VT(225),VBAR(225)          SWFL 28
     2, FWIND(225),NUMCH(225),NTEMP(8)                                  SWFL 29
     3,NCLOS(225)                                                       SWFL 30
C                                                                       SWFL 31
C                                       PRINTOUT AND PLOTTING           SWFL 32
C                                                                       SWFL 33
      COMMON   NPRT,IPRT,   NHPRT,JPRT(50),PRTH(30,50)                  SWFL 34
     1,  NQPRT,CPRT(50),PRTV(30,50),PRTQ(30,50),  IDUM(12),ICOL(10)     SWFL 35
     2,  LTIME,  NPLT,NPDEL,JPLT(50),HPLT(50)                           SWFL 36
C                                                                       SWFL 37
C                                       STAGE-TIME COEFFICIENTS         SWFL 38
C                                                                       SWFL 39
      COMMON YY(50) ,TT(50) ,AA(10),XX(10),SXX(10,10),SXY(10)           SWFL 40
     1,A1,A2,A3,A4,A5,A6,A7,PERIOD,JGW                                  SWFL 41
C                                                                       SWFL 42
C                                       STORMWATER                      SWFL 43
C                                                                       SWFL 44
      COMMON  TITLE(30),NJSW,QE(20,2),JSW(20)                           SWFL 45
     2, RAIN(100),INTIME(100),INRAIN,JBOUND(20),JJBOUN                  SWFL 46
C                                                                       SWFL 47
C                                       TAPES                           SWFL 48
C                                                                       SWFL 49
      COMMON /TAPES/ INCNT, IOUTCT,JIN(10),JOUT(10),NSCRAT(5)           SWFL 50
      COMMON/ST2/ TITEL2(40)                                            SWFL 51
C                                                                       SWFL 52
      DIMENSION ENDER(2)                                                SWFL 53
      COMMON       QT(20,2),ISW(20)                                     SWFL 54
      DATA ENDER / 4HENDQ, 4HUANT /                                     SWFL 55
C                                       TYPE DESIGNATIONS               SWFL 56
C                                                                       SWFL 57
      INTEGER CPRT                                                      SWFL 58
      REAL LEN,INTIME                                                   SWFL 59
C                                                                       SWFL 60
```

```
C                                       INITIALIZATION                  SWFL 61
C                                                                       SWFL 62
      N20 = NSCRAT(1)                                                   SWFL 63
      NEXIT=0                                                           SWFL 64
      DO 205 I=1,100                                                    SWFL 65
      DEP(I)=0.0                                                        SWFL 66
       AS(I)=0.                                                         SWFL 67
      QIN(I)=0.                                                         SWFL 68
      QUU(I)=0.                                                         SWFL 69
      DO 204 J=1,8                                                      SWFL 70
      IPOINT(I,J)=0                                                     SWFL 71
      NCHAN(I,J)=0                                                      SWFL 72
  204 CONTINUE                                                          SWFL 73
  205 CONTINUE                                                          SWFL 74
      DO 210 I=1,225                                                    SWFL 75
      FWIND(I) = 0.0                                                    SWFL 76
      DO 209 J=1,2                                                      SWFL 77
      NJUNC(I,J)=0                                                      SWFL 78
  209 CONTINUE                                                          SWFL 79
  210 CONTINUE                                                          SWFL 80
C                                                                       SWFL 81
C                                       SUBROUTINE INDATA CALLED TO     SWFL 82
C                                       READ INPUT DATA                 SWFL 83
C                                                                       SWFL 84
      CALL INDATA                                                       SWFL 85
C                                                                       SWFL 86
C                                       FURTHER INITIALIZATION          SWFL 87
C                                                                       SWFL 88
      IOUTCT = ICUTCT + 1                                               SWFL 89
      N21=JIN(INCNT)                                                    SWFL 90
      N22 = JCUT(IOUTCT)                                                SWFL 91
      REWIND N22                                                        SWFL 92
      NTINT = 0                                                         SWFL 93
      TT(1) = C.0                                                       SWFL 94
      TT(2) = C.0                                                       SWFL 95
      NSTEPS = 0                                                        SWFL 96
      MJSW   = 0                                                        SWFL 97
      NQUAL = C                                                         SWFL 98
      TDELT = C                                                         SWFL 99
      WEIR1 = A1
      WEIR2 = A2
      WEIR3 = A3
      IF (NPLT.GT.C) CALL OUTPUT(NTINT)                                 SWFL100
      DO 220 I=1,10                                                     SWFL101
  220 ICOL(I)=I                                                         SWFL102
      DO 222 I=1,20                                                     SWFL103
      ISW(I) = 0                                                        SWFL104
      QT(I,1) = 0.0                                                     SWFL105
      QT(I,2) = C.0                                                     SWFL106
      QE(I,1) = 0.0                                                     SWFL107
  222 QE(I,2) = 0.0                                                     SWFL108
      TE=0.                                                             SWFL109
      TEP=0.                                                            SWFL110
      DELT2=DELT/2.0                                                    SWFL111
      TZERO=TZERO*3600.0                                                SWFL112
      W=6.2832/(3600.*PERIOD)                                           SWFL113
      EVAP=EVAP/(12.*30.*86400.)                                        SWFL114
      TOLD=0.                                                           SWFL115
      KRAIN=1                                                           SWFL116
      PREC = 0.0                                                        SWFL117
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      T=TZERO                                                          SWFL118
  223 DO  224 I = 1,NHPRT                                              SWFL118A
      MJPRT = JPRT(I)                                                  SWFL118B
      PRTH (1,I) = H(MJPRT)                                            SWFL118C
  224 CONTINUE                                                         SWFL118D
      DO  225 I = 1,NCPRT                                              SWFL118E
      MCPRT = CPRT(I)                                                  SWFL118F
      PRTQ(1,I) = Q(MCPRT)                                             SWFL118G
      PRTV(1,I) = V(MCPRT)                                             SWFL118H
  225 CONTINUE                                                         SWFL118I
C                                                                      SWFL119
C                                     READING OF INITIAL HYDROGRAPH    SWFL120
C                                     INFORMATION FROM INTERFACING     SWFL121
C                                                                      SWFL122
      IF(N21.EQ.0) GO TO 230                                           SWFL123
      REWIND N21                                                       SWFL124
      READ (N21)         TITEL2                                        SWFL125
      WRITE (N6,7097)    TITEL2                                        SWFL126
 7097 FORMAT (20A4)                                                    SWFL127
      READ (N21)      NSTEPS,MJSW,NQUAL,TDELT,TZERO,TAREA              SWFL128X
      WRITE (N6,7091) NSTEPS,MJSW,NQUAL,TDELT,TZERO,TAREA              SWFL129X
 7091 FORMAT (3I10,3F10.2)                                             SWFL130X
      READ(N21) (ISW(L),L=1,MJSW)                                      SWFL131
      WRITE(6,7092) (ISW(L),L=1,MJSW)                                  SWFL133
 7092 FORMAT(5I15)                                                     SWFL134
      READ(N21) TT(1),(QT(L,1),L=1,MJSW)                               SWFL135
      WRITE(6,7093) TT(1),(QT(L,1),L=1,MJSW)                           SWFL137
      READ(N21) TT(2),(QT(L,2),L=1,MJSW)                               SWFL138
      WRITE(6,7093) TT(2),(QT(L,2),L=1,MJSW)                           SWFL140
      NINREC=2                                                         SWFL141
      I1=1                                                             SWFL142
      I2=2                                                             SWFL143
      TTP=0.                                                           SWFL144
  230 IF(NJSW.EQ.0) GO TO 235                                          SWFL145
      READ(N5,100) (JSW(L),L=1,NJSW)                                   SWFL146
      READ(N5,104) TE,(QE(L,2),L=1,NJSW)                               SWFL147
      WRITE(N6,102) (JSW(L),L=1,NJSW)                                  SWFL148
      TEP=TE/3600.                                                     SWFL149
      WRITE(N6,106) TEP,(QE(L,2),L=1,NJSW)                             SWFL150
  100 FORMAT (16I5)                                                    SWFL151
  102 FORMAT('1HYDROGRAPH INPUTS TO SYSTEM'//(6X,10I10))               SWFL152
  235 CONTINUE                                                         SWFL153
      TIME=TZERO                                                       SWFL154
C                                                                      SWFL155
C                                     INITIAL TIME-STAGE RELATIONSHIP  SWFL156
C                                     COMPUTED                         SWFL157
C                                                                      SWFL158
      IF (ISWCH(1).NE.1) GO TO 236                                     SWFL158A
      H(JGW)=A1+A2*SIN(W*T)+A3*SIN(2.*W*T)+A4*SIN(3.*W*T)              SWFL159
     1          +A5*COS(W*T)+A6*COS(2.*W*T)+A7*COS(3.*W*T)             SWFL160
  236 CONTINUE                                                         SWFL160A
C                                                                      SWFL161
C                                     CHANNEL CONSTANTS COMPUTED       SWFL162
C                                                                      SWFL163
  260 DO 280 N=1,NC                                                    SWFL164
      IF(NJUNC(N,1).LE.0)GO TO 280                                     SWFL165
      AK(N)=32.1739*AK(N)**2/2.208196                                  SWFL166
      NL=NJUNC(N,1)                                                    SWFL167
      NH=NJUNC(N,2)                                                    SWFL168
      R(N)=R(N)+(H(NL)+H(NH))/2.                                       SWFL169
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      A(N)=B(N)*R(N)                                                    SWFL170
      IF (WIND.LE.0.0) GO TO 270                                        SWFL171
      FWIND(N)=-WIND**2*COS(WDIR/57.-ATAN2((X(NH)-X(NL)),(Y(NH)-Y(NL))))SWFL172
     1 *8.64E-6                                                         SWFL173
  270 CONTINUE                                                          SWFL174
      AT(N)=A(N)                                                        SWFL175
      QAVE(N)=C.                                                        SWFL176
  280 CONTINUE                                                          SWFL177
C                                                                       SWFL178
C                                       NODAL VOLUMES COMPUTED          SWFL179
C                                                                       SWFL180
      DO 340 J=1,NJ                                                     SWFL181
      VOL(J)=0.                                                         SWFL182
      IF(AS(J).EQ.0.) GO TO 340                                         SWFL183
      AREA=0.                                                           SWFL184
      VOLUME=0.                                                         SWFL185
      DO 300 K=1,8                                                      SWFL186
      N=NCHAN(J,K)                                                      SWFL187
      IF(N.LE.0) GO TO 300                                              SWFL188
      AREA=AREA+B(N)*LEN(N)                                             SWFL189
      VOLUME=VOLUME+B(N)*LEN(N)*R(N)                                    SWFL190
  300 CONTINUE                                                          SWFL191
  320 DEPTH=VOLUME/AREA                                                 SWFL192
      VOL(J)=DEPTH*AS(J)                                                SWFL193
  340 CONTINUE                                                          SWFL194
C                                                                       SWFL195
C                                       START OF PROGRAM CORE, WITH     SWFL196
C                                       MAJOR HYDRAULIC COMPUTATIONS    SWFL197
C                                                                       SWFL198
C                                       START OF DAY DO LOOP, OUTER DO  SWFL199
C                                       LOOP OF 3 NESTED DO LOOPS       SWFL200
C                                                                       SWFL201
      DO 1300 NT=1,NTCYC                                                SWFL202
      IF(NT.LT.NQSWRT) GO TO 350                                        SWFL203
      REWIND N22                                                        SWFL204
      DO 345 J=1,NPLT                                                   SWFL205
      I=IABS(JPLT(J))                                                   SWFL206
  345 HPLT(J)=H(I)                                                      SWFL207
      HOUR=TZERO/3600.                                                  SWFL208
      WRITE(N22) HOUR,(HPLT(J),J=1,NPLT)                                SWFL209
      NPTOT=1                                                           SWFL210
  350 CONTINUE                                                          SWFL211
      LTIME = 1                                                         SWFL212
C                                                                       SWFL213
C                                       START OF QUALITY DO LOOP        SWFL214
C                                                                       SWFL215
      DO 1240 NQ=1,NQCYC                                                SWFL216
C                                                                       SWFL217
C                                       INITIALIZATION OF ARRAYS USED   SWFL218
C                                       FOR HYDRAULIC OUTPUT TO BE USED SWFL219
C                                       BY THE SWQUAL SUBROUTINE        SWFL220
C                                                                       SWFL221
      IF (NT.LT.NQSWRT) GO TO 380                                       SWFL222
      DO 360 N=1,NC                                                     SWFL223
      VBAR(N)=0.                                                        SWFL224
  360 QBAR(N)=0.                                                        SWFL225
      DO 370 J=1,NJ                                                     SWFL226
      HBAR(J)=0.                                                        SWFL227
      QINBAR(J)=0.                                                      SWFL228
      QOUBAR(J)=0.                                                      SWFL229
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  370 CONTINUE                                                          SWFL230
  380 CONTINUE                                                          SWFL231
C                                                                       SWFL232
C                                       START OF HYDRAULIC DO LOOP,     SWFL233
C                                       INNERMOST DO LOOP OF 3 NESTED   SWFL234
C                                       DO LOOPS                        SWFL235
C                                                                       SWFL236
      DO 1040 NHH=1,NHCYC                                               SWFL237
      IF(NT.LE.NQSWRT) GO TO 520                                        SWFL238
      TIME=TIME+DELT                                                    SWFL239
C                                                                       SWFL240
C                                       PRECIPITATION COMPUTATIONS FOR  SWFL241
C                                       EACH TIME STEP                  SWFL242
C                                                                       SWFL243
      PREC=0.                                                           SWFL244
  390 IF(KRAIN-NRAIN) 395,410,410                                       SWFL245
  395 IF(TIME-INTIME(KRAIN+1)) 405,400,400                              SWFL246
  400 PREC=PREC+RAIN(KRAIN)*(INTIME(KRAIN+1)-TOLD)/(12.*3600.)          SWFL247
      KRAIN=KRAIN+1                                                     SWFL248
      TOLD=INTIME(KRAIN)                                                SWFL249
      GO TO 390                                                         SWFL250
  405 PREC=(PREC+RAIN(KRAIN)*(TIME-TOLD)/(12.*3600.))/DELT              SWFL251
      TOLD=TIME                                                         SWFL252
  410 CONTINUE                                                          SWFL253
      IF(N21.EQ.0) GO TO 445                                            SWFL254
      DO 418 L=1,MJSW                                                   SWFL255
      J=ISW(L)                                                          SWFL256
  418 QIN(J)=QINST(J)*DELT                                              SWFL257
  420 IF(TIME-TT(I2)) 435,425,425                                       SWFL258
  425 DO 430 L=1,MJSW                                                   SWFL259
      J=ISW(L)                                                          SWFL260
  430 QIN(J)=QIN(J)+QT(L,I1)*(TT(I2)-TTP)                               SWFL261
      TTP=TT(I2)                                                        SWFL262
      ITEMP=I2                                                          SWFL263
      I2=I1                                                             SWFL264
      I1=ITEMP                                                          SWFL265
      IF(NINREC-NSTEPS) 431,432,432                                     SWFL266
  431 READ(N21) TT(I2),(QT(L,I2),L=1,MJSW)                              SWFL267
      NINREC=NINREC+1                                                   SWFL269
 7093 FORMAT(F10.1,6F15.2)                                              SWFL270
      WRITE(6,7094) TT(I2),(QT(L,I2),L=1,MJSW)    ,NINREC               SWFL271
 7094 FORMAT(F10.1,F10.1,I10)                                           SWFL272
      GO TO 420                                                         SWFL273
  432 TT(I2)=1CC0000.                                                   SWFL274
      DO 433 L=1,MJSW                                                   SWFL275
  433 QT(L,I2)=0.                                                       SWFL276
      GO TO 420                                                         SWFL277
  435 DO 440 L=1,MJSW                                                   SWFL278
      J=ISW(L)                                                          SWFL279
  440 QIN(J)=(QIN(J)+QT(L,I1)*(TIME-TTP))/DELT                          SWFL280
      TTP=TIME                                                          SWFL281
  445 CONTINUE                                                          SWFL282
      IF(NJSW.EQ.0) GO TO 520                                           SWFL283
C                                                                       SWFL284
C                                       READ HYDROGRAPH INPUT OR AVERAGESWFL295
C                                       OR INTERPOLATE FOR TIME STEP    SWFL286
C                                                                       SWFL287
      IF(TIME.LE.TE) GO TO 480                                          SWFL288
      TEU=TE                                                            SWFL289
      DO 460 L=1,NJSW                                                   SWFL290
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  460 QE(L,1)=QE(L,2)                                                    SWFL291
C                                                                        SWFL292
C                                        READ HYDROGRAPHS                SWFL293
C                                                                        SWFL294
      READ (N5,104) TE,(QE(JJ,2),JJ=1,NJSW)                              SWFL295
  104 FORMAT (8F10.0)                                                    SWFL296
  470 CONTINUE                                                           SWFL297
      TEP=TE/3600.                                                       SWFL298
      WRITE(N6,106) TEP,(QE(L,2),L=1,NJSW)                               SWFL299
  106 FORMAT(' *F7.2,10F10.1/(8X,10F10.1))                               SWFL300
C                                                                        SWFL301
C                                     INTERPOLATE HYDROGRAPH             SWFL302
C                                                                        SWFL303
  480 DO 500 L=1,NJSW                                                    SWFL304
      J=JSW(L)                                                           SWFL305
      SLOPE=(QE(L,2)-QE(L,1))/(TE-TEO)                                   SWFL306
  500 QIN(J)=QINST(J)+QE(L,1)+SLOPE*(TIME-TEO)                           SWFL307
  520 CONTINUE                                                           SWFL308
C                                                                        SWFL309
C                                     INITIALIZATION                     SWFL310
C                                                                        SWFL311
      T2=T+DELT2                                                         SWFL312
      T=T+DELT                                                           SWFL313
      DO 525 N=1,NC                                                      SWFL314
      NCLOS(N)=0                                                         SWFL315
      DO 525 M=1,2                                                       SWFL316
  525 NJUNC(N,M)=IABS(NJUNC(N,M))                                        SWFL317
      DO 530 J=1,NJ                                                      SWFL318
      AS(J)=ABS(AS(J))                                                   SWFL319
      DO 530 K=1,8                                                       SWFL320
  530 NCHAN(J,K)=IABS(NCHAN(J,K))                                        SWFL321
      NTIMS=0                                                            SWFL322
C                                                                        SWFL323
C                                     COMPUTATIONS OF VELOCITIES AT      SWFL324
C                                     HALF TIME STEP, AND FLOWS AT       SWFL325
C                                     QUARTER TIME STEP                  SWFL326
C                                                                        SWFL327
  540 CONTINUE                                                           SWFL328
      NDRY=0                                                             SWFL329
      NTIMS=NTIMS+1                                                      SWFL330
      DO 580 N=1,NC                                                      SWFL331
      IF(NJUNC(N,1).LE.0)GO TO 580                                       SWFL332
C                                                                        SWFL333
C                                     DRY CHANNEL CHECK (UNDER 0.1 FT)   SWFL334
C                                                                        SWFL335
      IF(R(N).GT.0.1) GO TO 560                                          SWFL336
      V(N)=0.0                                                           SWFL337
      Q(N)=0.0                                                           SWFL338
      GO TO 580                                                          SWFL339
  560 CONTINUE                                                           SWFL340
      NL=NJUNC(N,1)                                                      SWFL341
      NH=NJUNC(N,2)                                                      SWFL342
      DELV2=V(N)*(1.-AT(N)/A(N))                                         SWFL343
     1 +DELT2*((V(N)**2*B(N)/A(N))-32.1739)*(H(NH)-H(NL))/LEN(N)         SWFL344
     2+FWIND(N)/R(N)*DELT2                                               SWFL345
      V2=V(N)+DELV2                                                      SWFL346
      TEMP=DELT2*AK(N)/R(N)**1.3333333                                   SWFL347
      DELV1=0.5*((1./TEMP+2.*ABS(V2))-                                   SWFL348
     1SQRT((1./TEMP+ABS(2.*V2))**2-4.*V2**2))                            SWFL349
      DELV1=-SIGN(DELV1,V2)                                              SWFL350
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      VT(N)=V(N)+DELV1+DELV2                                          SWFL351
      Q(N)=VT(N)*A(N)                                                 SWFL352
  580 CONTINUE                                                        SWFL353
C                                                                     SWFL354
C                                        COMPUTATION OF NODAL STAGE AT SWFL355
C                                        HALF TIME STEP               SWFL356
C                                                                     SWFL357
      DO 660 J=1,NJ                                                   SWFL358
      SUMQ=0.                                                         SWFL359
      DO 620 K=1,8                                                    SWFL360
      IF(NCHAN(J,K).LE.0) GO TO 620                                   SWFL361
      N=NCHAN(J,K)                                                    SWFL362
      IF(J.NE.NJUNC(N,1))GO TO 600                                    SWFL363
      SUMQ=SUMQ+C(N)                                                  SWFL364
      GO TO 620                                                       SWFL365
  600 SUMQ=SUMQ-C(N)                                                  SWFL366
  620 CONTINUE                                                        SWFL367
                                                                      SWFL368
  640 IF(AS(J).LE.0.) GO TO 660                                       SWFL369
      SUMQ=COU(J)-QIN(J)+(EVAP-PREC)*AS(J)+SUMQ                       SWFL370
      IF (J.EQ.JGW.AND.ISWCH(1).NE.1) GO TO 650                       SWFL370T
      HT(J)=H(J)-DELT2*SUMQ/AS(J)                                     SWFL371
      IF(HT(J)+DEP(J).GT.0.) GO TO 660                                SWFL372
      HT(J)=-DEP(J)                                                   SWFL373
      VOL(J)=0.                                                       SWFL374
      AS(J)=-AS(J)                                                    SWFL375
      DO 645 K=1,8                                                    SWFL376
      NX=NCHAN(J,K)                                                   SWFL377
      IF(NX.LE.0) GO TO 645                                           SWFL378
      NCLOS(NX)=1                                                     SWFL379
  645 CONTINUE                                                        SWFL380
      NDRY=NDRY+1                                                     SWFL381
      GO TO 660
  650 CONTINUE
      DELHH=0.
      DO 655 ICT=1,3
      DELHH=DELT2/AS(J)*(-SUMQ-WEIR1*(H(JGW)-WEIR2+DELHH/2.)**WEIR3)
  655 CONTINUE
      HT(J)=H(J)+DELHH
  660 CONTINUE                                                        SWFL382
      IF(NDRY.EQ.0) GO TO 675                                         SWFL383
      IF(NTIPS.GT.2) GO TO 675                                        SWFL384
      DO 670 N=1,NC                                                   SWFL385
      IF(NJUNC(N,1).LE.0) GO TO 670                                   SWFL386
      IF(NCLOS(N).NE.1) GO TO 670                                     SWFL387
      Q(N)=0.                                                         SWFL388
      V(N)=0.                                                         SWFL389
      DO 668 I=1,2                                                    SWFL390
      II=NJUNC(N,I)                                                   SWFL391
      DO 664 J=1,8                                                    SWFL392
      IF(NCHAN(II,J).EQ.N) GO TO 666                                  SWFL393
  664 CONTINUE                                                        SWFL394
      GO TO 668                                                       SWFL395
  666 NCHAN(II,J)=-N                                                  SWFL396
  668 NJUNC(N,I)=-II                                                  SWFL397T
  670 CONTINUE                                                        SWFL398
      GO TO 540                                                       SWFL399
  675 CONTINUE                                                        SWFL400
C                                                                     SWFL401
C                                        BOUNDARY STAGE CONDITION AT  SWFL402
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C                                        HALF TIME STEP                    SWFL403
C                                                                          SWFL404
      IF (ISHCH(1).NE.1) GO TO 676                                         SWFL404T
      HT(JGW)=A1+A2*SIN(W*T2)+A3*SIN(2.*W*T2)+A4*SIN(3.*W*T2)              SWFL405
     1          +A5*COS(W*T2)+A6*COS(2.*W*T2)+A7*COS(3.*W*T2)              SWFL406
  676 CONTINUE                                                             SWFL406T
                                                                           SWFL407
C                                                                          SWFL408
C                                        COMPUTATION OF CHANNEL CROSS-     SWFL409
C                                        SECTIONAL AREAS AT HALF TIME      SWFL410
C                                        STEP, FLOWS AT HALF TIME STEP,    SWFL411
C                                        AND VELOCITIES AT FULL TIME STEP  SWFL412
C                                                                          SWFL413
      DO 740 N=1,NC                                                        SWFL414
      IF(NJUNC(N,1).LE.0)GO TO 740                                         SWFL415
      NL=NJUNC(N,1)                                                        SWFL416
      NH=NJUNC(N,2)                                                        SWFL417
      DELH=0.5*(HT(NH)-H(NH)+HT(NL)-H(NL))                                 SWFL418
      RNT=R(N)+DELH                                                        SWFL419
      AT(N)=A(N)+B(N)*DELH                                                 SWFL420
C                                                                          SWFL421
C                                        DRY CHANNEL CHECK (UNDER 0.1 FT)  SWFL422
C                                                                          SWFL423
      IF(RNT.GT.0.1) GO TO 680                                             SWFL424
      V(N)=0.                                                              SWFL425
      Q(N)=0.                                                              SWFL426
      GO TO 700                                                            SWFL427
  680 CONTINUE                                                             SWFL428
      DELV2=2.*VT(N)*(1.-A(N)/AT(N))                                       SWFL429
     1 +DELT*((VT(N)**2*B(N)/AT(N))-32.1739)*(HT(NH)-HT(NL))/LEN(N)        SWFL430
     1+FWIND(N)/RNT*DELT                                                   SWFL431
      V2= V(N)+DELV2                                                       SWFL432
      TEMP=DELT*AK(N)/RNT**1.3333333                                       SWFL433
      DELV1=0.5*((1./TEMP+2.*ABS(V2))-                                     SWFL434
     1SQRT((1./TEMP+2.*ABS(V2))**2-4.*V2**2))                              SWFL435
      DELV1=-SIGN(DELV1,V2)                                                SWFL436
      V(N)=V(N)+DELV1+DELV2                                                SWFL437
      Q(N)=0.5*(C(N)+V(N)*AT(N))                                           SWFL438
  700 CONTINUE                                                             SWFL439
C                                                                          SWFL440
C                                        CHANNEL FLOWS SUMMED              SWFL441
C                                                                          SWFL442
      IF (NT.LT.NCSWRT) GO TO 720                                          SWFL443
      QBAR(N)=QBAR(N)+Q(N)                                                 SWFL444
      VBAR(N)=VBAR(N)+V(N)                                                 SWFL445
  720 CONTINUE                                                             SWFL446
C                                                                          SWFL447
C                                        EXCESSIVE VELOCITY CHECK          SWFL448
C                                                                          SWFL449
      IF(ABS(V(N)).LE.20.0)GO TO 740                                       SWFL450
      WRITE(6,108) NT,NC,NHH,R(N),V(N),N                                   SWFL451
  108 FORMAT('0 V OVER 20 FPS, TIDAL CYCLE',I4,' QUAL CYCLE',I4,' HYDRO    SWFL452
     1CYCLE',I4,' DEPTH',E10.4,'   V',E10.4,' CHANNEL',I5)                 SWFL453
      NEXIT=1                                                              SWFL454
  740 CONTINUE                                                             SWFL455
      IF (NEXIT.EQ.1) GO TO 1260                                           SWFL456
C                                                                          SWFL457
C                                        COMPUTATION OF NODAL STAGE AND    SWFL458
C                                        VOLUME AT FULL TIME STEP          SWFL459
C                                                                          SWFL460
  760 DO 900 J=1,NJ
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```
      SUMQ=0.                                                                  SWFL461
      HN(J)=-DEP(J)                                                            SWFL462
      IF(AS(J).LE.0.) GO TO 900                                                SWFL463
      DO 800 K=1,8                                                             SWFL464
      IF(NCHAN(J,K).LE.0) GO TO 800                                            SWFL465
      N=NCHAN(J,K)                                                             SWFL466
      IF(J.NE.NJUNC(N,1))GO TO 780                                             SWFL467
      SUMQ=SUMQ+Q(N)                                                           SWFL468
      GO TO 800                                                                SWFL469
  780 SUMQ=SUMQ-Q(N)                                                           SWFL470
  800 CONTINUE                                                                 SWFL471
      IF(J.NE.JGW) GO TO 820                                                   SWFL472
      IF (ISWCH(1).NE.1) GO TO 802                                             SWFL472T
      HN(JGW)=A1+A2*SIN(W*T)+A3*SIN(2.*W*T)+A4*SIN(3.*W*T)                     SWFL473
     1          +A5*COS(W*T)+A6*COS(2.*W*T)+A7*COS(3.*W*T)                     SWFL474
      GO TO 814                                                                SWFL474T
  802 CONTINUE                                                                 SWFL474A
      DELHH=DELHH*2.                                                           SWFL474B
      DO 808 ICT=1,3                                                           SWFL474C
      DELHH=DELT/AS(J)*(-SUMQ-WEIR1*(H(JGW)-WEIR2+DELHH/2.)**WEIR3)            SWFL474D
  808 CONTINUE                                                                 SWFL474E
      HN(J)=H(J)+DELHH                                                         SWFL474F
  814 CONTINUE                                                                 SWFL474G
      DVOL=(HN(JGW)-H(JGW))*AS(JGW)                                            2WWCM75
      QOU(JGW)=0.                                                              SWFL476
      QIN(JGW)=(DVOL/DELT)+SUMQ                                                SWFL477
      IF (QIN(JGW).GT.0.) GO TO 815                                            SWFL478
      QOU(JGW)=-QIN(JGW)                                                       SWFL479
      QIN(JGW)=0.                                                              SWFL480
  815 VOL(JGW)=VOL(JGW)+DVOL                                                   SWFL481
      GO TO 825                                                                SWFL482
C                                                                              SWFL483
C                                        COMPUTATION OF 'ORDINARY' NODES       SWFL484
C                                        VOLUME AND STAGE                      SWFL485
C                                                                              SWFL485
  820 SUMQ=QOU(J)-QIN(J)+(EVAP-PREC)*AS(J)+SUMQ                                SWFL487
      HN(J)=H(J)-DELT*SUMQ/AS(J)                                               SWFL488
      VOL(J)=VOL(J)-DELT*SUMQ                                                  SWFL489
C                                                                              SWFL490
  825 CONTINUE                                                                 SWFL491
  900 CONTINUE                                                                 SWFL492
C                                                                              SWFL493
C                                        NODAL VOLUMES AND FLOWS SUMMED        SWFL494
C                                                                              SWFL495
      IF (NT.LT.NQSWRT) GO TO 940                                              SWFL496
      DO 920 J=1,NJ                                                            SWFL497
      HBAR(J)=HBAR(J)+HN(J)                                                    SWFL498
      QINBAR(J)=QINBAR(J)+QIN(J)                                               SWFL499
      QOUBAR(J)=QOUBAR(J)+QOU(J)                                               SWFL500
  920 CONTINUE                                                                 SWFL501
  940 CONTINUE                                                                 SWFL502
C                                                                              SWFL503
C                                        FULL TIME STEP COMPUTATION OF         SWFL504
C                                        HYDRAULIC RADIUS AND CHANNEL          SWFL505
C                                        CROSS-SECTIONAL AREAS                 SWFL506
C                                                                              SWFL507
  960 DO 980 N=1,NC                                                            SWFL508
      IF(NJUNC(N,1).EQ.0) GO TO 980                                            SWFL509
      NL=IABS(NJUNC(N,1))                                                      SWFL510
      NH=IABS(NJUNC(N,2))                                                      SWFL511
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      DELH=0.5*(HN(NH)-H(NH)+HN(NL)-H(NL))                                  SWFL512
      R(N)=R(N)+DELH                                                        SWFL513
      A(N)=A(N)+B(N)*DELH                                                   SWFL514
  980 CONTINUE                                                              SWFL515
                                                                            SWFL516
C                                                                           SWFL517
C                                        NODAL STAGE ARRAYS SHIFTED         SWFL518
C                                                                           SWFL519
 1000 DO 1020 J=1,NJ                                                        SWFL520
 1020 H(J)=HN(J)                                                            SWFL521
      IF(NT.LT.NQSWRT) GO TO 1040                                           SWFL522
      IF(NPTOT.NE.NPDEL) GO TO 1030                                         SWFL523
      DO 1025 J=1,NPLT                                                      SWFL524
      I=IABS(JPLT(J))                                                       SWFL525
 1025 HPLT(J)=H(I)                                                          SWFL526
      HOUR=HOUR+DELT/3600.*NPDEL                                            SWFL527
      WRITE(N22) HOUR,(HPLT(J),J=1,NPLT)                                    SWFL528
      NPTOT=0                                                               SWFL529
 1030 NPTOT=NPTOT+1                                                         SWFL530
C                                                                           SWFL531
C                                        END OF HYDRAULIC OR INNER DO       SWFL532
C                                        LOOP                               SWFL533
C                                                                           SWFL534
 1040 CONTINUE                                                              SWFL535
C                                                                           SWFL536
C                                        AVERAGING OF FLOWS AND             SWFL537
C                                        VELOCITIES                         SWFL538
C                                                                           SWFL539
      IF (NT.LT.NQSWRT) GO TO 1100                                          SWFL540
      DO 1060 N=1,NC                                                        SWFL541
      IF(NJUNC(N,1).LE.0) GO TO 1060                                        SWFL542
      QBAR(N)=QBAR(N)/FLOAT(NHCYC)                                          SWFL543
      VBAR(N)=VBAR(N)/FLOAT(NHCYC)                                          SWFL544
      QAVE(N)=QAVE(N)+QBAR(N)/FLOAT(NQCYC)                                  SWFL545
 1060 CONTINUE                                                              SWFL546
      DO 1080 J=1,NJ                                                        SWFL547
      QINBAR(J)=QINBAR(J)/FLOAT(NHCYC)                                      SWFL548
      QOUBAR(J)=QOUBAR(J)/FLOAT(NHCYC)                                      SWFL549
      HBAR(J)=HBAR(J)/FLOAT(NHCYC)                                          SWFL550
      IF(QINBAR(J).EQ.0.) GOTO 1080                                         SWFL551
      IF(QOUBAR(J).EQ.0.) GOTO 1080                                         SWFL552
      QINBAR(J)=QINBAR(J)-QOUBAR(J)                                         SWFL553
      QOUBAR(J)=0.                                                          SWFL554
      IF(QINBAR(J).GT.0.) GO TO 1080                                        SWFL555
      QOUBAR(J)=-QINBAR(J)                                                  SWFL556
      QINBAR(J)=0.                                                          SWFL557
 1080 CONTINUE                                                              SWFL558
C                                                                           SWFL559
C                                        WRITE HYDRAULIC INFORMATION FOR    SWFL560
C                                        USE IN QUALITY PROGRAM             SWFL561
C                                                                           SWFL562
      WRITE(N20) NQ,(QBAR(N),VBAR(N),N=1,NC),                               SWFL563
     1 (VOL(J),QINBAR(J),QOUBAR(J),J=1,NJ)                                  SWFL564
C                                                                           SWFL565
C                                        STORE OUTPUT FOR SUBSEQUENT        SWFL566
C                                        PRINTOUT                           SWFL567
C                                                                           SWFL568
 1100 IF (NT.EQ.(NQSWRT-1).AND.NQ.EQ.NQCYC) GO TO 1120                      SWFL569
      GO TO 1180                                                            SWFL570
 1120 DO 1140 I = 1,NHPRT                                                   SWFL571
      MJPRT = JPRT(I)
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      PRTH (1,I) = H(MJPRT)                                              SWFL572
 1140 CONTINUE                                                           SWFL573
      DO 1160 I = 1,NQPRT                                                SWFL574
      MCPRT = CPRT(I)                                                    SWFL575
      PRTQ(1,I) = Q(MCPRT)                                               SWFL576
      PRTV(1,I) = V(MCPRT)                                               SWFL577
 1160 CONTINUE                                                           SWFL578
      GO TO 1240                                                         SWFL579
 1180 IF(NT.LT.NQSWRT) GO TO 1240                                        SWFL580
      LTIME = LTIME + 1                                                  SWFL581
C                                                                        SWFL582
C                                     STORE STAGE INFORMATION            SWFL583
C                                                                        SWFL584
      DO 1200 I=1,NHPRT                                                  SWFL585
      MJPRT=JPRT(I)                                                      SWFL586
 1200 PRTH(LTIME,I)=H(MJPRT)                                             SWFL587
C                                                                        SWFL588
C                                     STORE FLOWS AND VELOCITIES         SWFL589
C                                                                        SWFL590
      DO 1220 I=1,NCPRT                                                  SWFL591
      MCPRT=CPRT(I)                                                      SWFL592
      PRTQ(LTIME,I)=Q(MCPRT)                                             SWFL593
 1220 PRTV(LTIME,I)=V(MCPRT)                                             SWFL594
C                                                                        SWFL595
C                                     END OF QUALITY DO LOOP             SWFL596
C                                                                        SWFL597
 1240 CONTINUE                                                           SWFL598
      IF(ISWCH(1).NE.1) GO TO 1280                                       SWFL599
      IF (NT.NE.NQSWRT) GO TO 1280                                       SWFL600
 1260 CONTINUE                                                           SWFL601
 1280 CONTINUE                                                           SWFL602
C                                                                        SWFL603
C                                     SUBROUTINE PRTOUT CALLED FOR       SWFL604
C                                     HYDRAULIC INFORMATION PRINTOUT     SWFL605
C                                     FOR A ONE DAY CYCLE                SWFL606
C                                                                        SWFL607
      IF (NT.LT.NQSWRT) GO TO 1300                                       SWFL608
      CALL PRTOUT                                                        SWFL609
C                                                                        SWFL610
C                                     END OF SUBROUTINE SWFLOW           SWFL611
C                                                                        SWFL612
 1300 CONTINUE                                                           SWFL613
      END FILE N20                                                       SWFL614
      REWIND N20                                                         SWFL615
 1320 CONTINUE                                                           SWFL616
      MCOUNT = 0                                                         SWFL617
 1340 READ (N5,110) FINAL,CARD                                           SWFL618
  110 FORMAT (2A4)                                                       SWFL619
      IF (FINAL.EQ.ENDER(1)) GO TO 1360                                  SWFL620
      MCOUNT = MCOUNT + 1                                                SWFL621
      IF (MCOUNT.GT.30) GO TO 1380                                       SWFL622
      GO TO 1340                                                         SWFL623
 1360 IF (CARD.EQ.ENDER(2)) GO TO 1400                                   SWFL624
      MCOUNT = MCOUNT + 1                                                SWFL625
      IF (MCOUNT.GT.30) GO TO 1380                                       SWFL626
      GO TO 1340                                                         SWFL627
 1380 WRITE (N6,112)                                                     SWFL628
  112 FORMAT (62HOQUALITY PROGRAM HAS READ MORE THAN 30 CARDS AFTER COMPSWFL629
     1PLETION)                                                           SWFL630
      STOP 4444                                                          SWFL631X
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 1400 WRITE (N6,114)                                                    SWFL632
  114 FORMAT (33HOCOMPLETION OF RECEIVING QUANTITY)                     SWFL633
 1420 CONTINUE                                                          SWFL634
C                                                                       SWFL635
C                                    RETURN TO SUBROUTINE RECEIV        SWFL636
C                                                                       SWFL637
      RETURN                                                            SWFL638
      END                                                               SWFL639
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      SUBROUTINE SWQUAL                                                 SWQU  1
C                                                                       SWQU  2
C                                       RECEIVING WATER QUALITY         SWQU  3
C                                                                       SWQU  4
C                                                                       SWQU  5
C                                       SPECIFICATION STATEMENTS        SWQU  6
C                                                                       SWQU  7
C                                       GENERAL AND CONTROL             SWQU  8
C                                                                       SWQU  9
      COMMON JGW,NTC,NQCYC,DELTQ,QE,QF,ALPHA(30),TITLSW(30),ICOL(10)    SWQU 10
     1 ,ISWCH(10),REAER(6),DECAY(6),XR(6),XME(6),XMF(6),XMED(6)         SWQU 11
     2 ,N5,N6,N10,N20,N30,N40,NSTART,XRQD                               SWQU 12
C                                                                       SWQU 13
C                                       JUNCTIONS                       SWQU 14
C                                                                       SWQU 15
      COMMON NJ,NCHAN(100,8),QIN(100),QOU(100),VOL(100),VOLD(100)       SWQU 16
     1 ,AS(100)                                                         SWQU 17
C                                                                       SWQU 18
C                                       CHANNELS                        SWQU 19
C                                                                       SWQU 20
      COMMON NC,NJUNC(225,2),Q(225),LEN(225),U(225)                     SWQU 21
C                                                                       SWQU 22
C                                       STORMWATER                      SWQU 23
C                                                                       SWQU 24
      COMMON NJSW,JSW(20)                                               SWQU 25
     1,MJSW,ISW(20),TT(2),CT(6,20,2),INSTM                              SWQU 26
C                                                                       SWQU 27
C                                       QUALITY                         SWQU 28
C                                                                       SWQU 29
      COMMON KCON,KCONO,C2(6),CS(6),ICON(6),CSAT(6),C(100,6),SUMC(100,6)SWQU 30
     1 ,CMAX(100,6),CMIN(100,6),MADD(100,6),DCDT(100,6),CE(6,20,2)      SWQU 31
     2 ,TE( 6),TEP( 6),SLOPE(20),CSPIN(100,6),TITLE(6,6),TED(6)         SWQU 32
C                                                                       SWQU 33
C                                       PRINTING                        SWQU 34
C                                                                       SWQU 35
      COMMON NCPRT,ITCPRT,LQCPRT,NSTPRT,NQCTOT,ISKIP,MSTPRT,NPRT,KPRT   SWQU 36
C                                                                       SWQU 37
C                                                                       SWQU 38
C                                       TAPES                           SWQU 39
C                                                                       SWQU 40
      COMMON /TAPES/ INCNT,IOUTCT,JIN(10),JOUT(10),NSCRAT(5)            SWQU 41
C                                                                       SWQU 42
C                                       START PROGRAM                   SWQU 43
C                                       INPUT ROUTINE                   SWQU 44
C                                                                       SWQU 45
      REAL MADD,LEN                                                     SWQU 46
      N20 = NSCRAT(1)                                                   SWQU 47
      INSTM=0                                                           SWQU 48
C                                                                       SWQU 49
C                                       CALL TO SUBROUTINE INQUAL       SWQU 50
C                                                                       SWQU 51
      CALL INCLAL                                                       SWQU 52
C                                                                       SWQU 53
C                                       MAIN QUALITY LOOP               SWQU 54
C                                                                       SWQU 55
      DO 751 NTAG=NSTART,NTC                                            SWQU 56
      REWIND N10                                                        SWQU 57
      NSTPRT = NTAG                                                     SWQU 58
C                                                                       SWQU 59
C                                                                       SWQU 60
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C                                          CALL TO QUALITY CYCLE SUBROUTINESWQU  61
C                                                                        SWQJ  62
      CALL LCCPCL                                                        SWQU  63
      INSTM=INSTM+1                                                      SWQU  64
C                                                                        SWQU  65
C                                          PRINT DAY AVERAGE CONCENTRATIONSSWQU  66
C                                                                        SWQU  67
      DO 359 J = 1,NJ                                                    SWQU  68
      DO 359 KC=1,KCON                                                   SWQJ  69
  359 SUMC(J,KC)=(SUMC(J,KC)-0.5*C(J,KC))/NQCYC                          SWQU  70
      IF (NTAG.LT.KPRT) GO TO 3220                                       SWQU  71
      IF (NTAG.GT.KPRT.AND.KPRT.EQ.1) GO TO 1600                         SWQU  72
      GO TO 4300                                                         SWQU  73
 1600 WRITE(N6,3030)                                                     SWQJ  74
 3030  FORMAT(42H KPRT IS ALWAYS GOING TO BE LESS THAN NTAG)             SWQU  75
      STOP 5555                                                          SWQU 76X
 4300 CONTINUE                                                           SWQJ  77
      KPRT=KPRT+NPRT                                                     SWQU  78
  752 CONTINUE                                                           SWQJ  79
      DO 322 KC=1,KCCN                                                   SWQU  80
      WRITE (N6,4100) TITLSW                                             SWQU  81
 4100 FORMAT(1H1,15A4,15A4)                                              SWQJ  82
      WRITE(6,101) ALPHA                                                 SWQU  83
  101 FORMAT(1H0,15A4,36X,32H WATER RESOURCES ENGINEERS, INC./           SWQJ  84
     1       1H ,15A4,36X,25H WALNUT CREEK, CALIFORNIA/                  SWQU  85
     2       1H ,96X,28H DYNAMIC STORM WATER QUALITY//)                  SWQJ  86
      WRITE (6,321) NTAG,KC,(TITLE(I,KC),I=1,6),ICOL                     SWQU  87
  321 FORMAT('0',10X,'AVERAGE JUNCTION CONCENTRATIONS DURING TIDAL OR TIMSWQJ  88
     1E CYCLE',I4,', CONSTITLENT NUMBER',I3,5X,6A4//9X,10I10/'    JUNCTIONSWQJ  89
     2')                                                                 SWQU  90
      DO 110 I=1,NJ,10                                                   SWQU  91
      L=MINO(I+9,NJ)                                                     SWQU  92
  110 WRITE (6,111) I,L,(SUMC(J,KC),J=I,L)                               SWQU  93
  111 FORMAT(I4,5H  TO ,I3,1X,10E10.4)                                   SWQU  94
      IF(ISWCH(2).EQ.1) GO TO 322                                        SWQU  95
      WRITE (6,112)                                                      SWQU  96
  112 FORMAT('0',50X,'MAXIMUMS'/'   JUNCTION')                           SWQU  97
      DO 113 I=1,NJ,10                                                   SWQU  98
      L=MINO(I+9,NJ)                                                     SWQU  99
  113 WRITE (6,111) I,L,(CMAX(J,KC),J=I,L)                               SWQU100
      WRITE (6,114)                                                      SWQU101
  114 FORMAT('0',50X,'MINIMUMS'/'   JUNCTION')                           SWQU102
      DO 115 I=1,NJ,10                                                   SWQU103
      L=MINO(I+9,NJ)                                                     SWQU104
  115 WRITE (6,111) I,L,(CMIN(J,KC),J=I,L)                               SWQU105
  322 CONTINUE                                                           SWQU106
C                                                                        SWQJ107
C                                          RESET SUMS FOR NEXT DAY CYCLE SWQU108
C                                                                        SWQJ109
 3220 CONTINUE                                                           SWQU110
      DO 323 J=1,NJ                                                      SWQU111
      VOLO(J)=VOL(J)                                                     SWQU112
      DO 323 KC=1,KCON                                                   SWQU113
      CMAX(J,KC)=0.                                                      SWQU114
      CMIN(J,KC)=C(J,KC)                                                 SWQU115
  323 SUMC(J,KC)=0.5*C(J,KC)                                             SWQU116
      IF (NTAG.EC.NTC) GO TO 4140                                        SWQU117
      REWIND N10                                                         SWQU118
C                                                                        SWQU119
C                                          ISWCH 10 SET BY N30 READ-IN   SWQJ120
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C                                                                       SWQU121
      IF (ISWCH(10).EQ.1) GO TO 4140                                    SWQU122
      DO 4120 I=1,NQCYC                                                 SWQU123
      READ(N2C) NQ,(Q(N),U(N),N=1,NC),(VOL(J),QIN(J),QOU(J),J=1,NJ)     SWQU124
      WRITE(N10)NQ,(Q(N),U(N),N=1,NC),(VOL(J),QIN(J),QOU(J),J=1,NJ)     SWQU125
 4120 CONTINUE                                                          SWQU126
      REWIND N10                                                        SWQU127
 4140 CONTINUE                                                          SWQU128
C                                                                       SWQU129
C                                                                       SWQU130
C                                        END OF MAIN DO-LOOP            SWQU131
C                                                                       SWQU132
  751 CONTINUE                                                          SWQU133
      IF (ISWCH(3).EQ.1) GO TO 4160                                     SWQU134
      RETURN                                                            SWQU135
C                                                                       SWQU136
C                                        WRITE A RESTART TAPE           SWQU137
C                                                                       SWQU138
 4160 CONTINUE                                                          SWQU139
      WRITE (N40) JGW,KCON,KCONC,NTC,NPRT,NJSW,TITLE,C2,CS,ICON,CSAT,   SWQU140
     1 REAER,DECAY,XR,XME,XMF,XMEO,(VOLO(J),(C(J,K),SUMC(J,K),          SWQU141
     2 MADD(J,K),CMAX(J,K),CMIN(J,K),K=1,KCON),J=1,NJ)                  SWQU142
      DO 4465 I=1,NQCYC                                                 SWQU143
      REWIND N10                                                        SWQU144
      READ(N10) NQ,(Q(N),U(N),N=1,NC),(VOL(J),QIN(J),QOU(J),J=1,NJ)     SWQU145
      WRITE(N40)NQ,(Q(N),U(N),N=1,NC),(VOL(J),QIN(J),QOU(J),J=1,NJ)     SWQU146
 4465 CONTINUE                                                          SWQU147
      END FILE N40                                                      SWQU148
      REWIND N40                                                        SWQU149
      RETURN                                                            SWQU150
      END                                                               SWQU151
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      SUBROUTINE TIDCF(KO,NI,MAXIT,NCHTID)                              TIDC  1
C                                                                       TIDC  2
C                                     STAGE TIME COEFFICIENTS           TIDC  3
C                                     HYDRODYNAMICS PROGRAM             TIDC  4
C                                     SPECIFICATION STATEMENTS          TIDC  5
C                                                                       TIDC  6
C                                                                       TIDC  7
C                                     CONTROL                           TIDC  8
C                                                                       TIDC  9
      COMMON /CCNTR/ N5,N6,N20,N21,  NTCYC,NQCYC,NHCYC,  NT,NQSWRT      TIDC 10
     1,  DELTQ,DELT,TZERO,   ISWCH(10)                                  TIDC 11
C                                                                       TIDC 12
C                                     GENERAL                           TIDC 13
C                                                                       TIDC 14
      COMMON  ALPHA(30),  NJ,NC,   ICYC,KCYC,NCYC,   WIND,WDIR,EVAP     TIDC 15
     1,  PRECP(50),NEXIT                                                TIDC 16
C                                                                       TIDC 17
C                                     JUNCTIONS                         TIDC 18
C                                                                       TIDC 19
      COMMON  H(100),HN(100),HT(100),HBAR(100),HAVE(100)                TIDC 20
     1,  NCHAN(100,8),IPOINT(100,8),AS(100),VOL(100),X(100),Y(100)      TIDC 21
     2,  DEP(100),COF(100),QIN(100),QOU(100),QINST(100)                 TIDC 22
     3,  QINBAR(100),QOUBAR(100)                                        TIDC 23
C                                                                       TIDC 24
C                                     CHANNELS                          TIDC 25
C                                                                       TIDC 26
      COMMON LEN(225),NJUNC(225,2),B(225),R(225),A(225),AT(225),AK(225) TIDC 27
     1,   Q(225),QBAR(225),QAVE(225), V(225),VT(225),VBAR(225)          TIDC 28
     2, FWINC(225),NUMCH(225),NTEMP(8)                                  TIDC 29
     3,NCLOS(225)                                                       TIDC 30
C                                                                       TIDC 31
C                                     PRINTOUT AND PLOTTING             TIDC 32
C                                                                       TIDC 33
      COMMON   NPRT,IPRT,   NHPRT,JPRT(50),PRTH(30,50)                  TIDC 34
     1,  NQPRT,CPRT(50),PRTV(30,50),PRTQ(30,50),  IDUM(12),IDEL(10)     TIDC 35
     2,  LTIME,  APLT,NPDEL,JPLT(50),HPLT(50)                           TIDC 36
C                                                                       TIDC 37
C                                     STAGE-TIME COEFFICIENTS           TIDC 38
C                                                                       TIDC 39
      COMMON YY(50) ,TT(50) ,AA(10),XX(10),SXX(10,10),SXY(10)           TIDC 40
     1,A1,A2,A3,A4,A5,A6,A7,PERIOD,JGW                                  TIDC 41
C                                                                       TIDC 42
C                                     STORMWATER                        TIDC 43
C                                                                       TIDC 44
      COMMON TITLE(30),NJSW,QE(20,2),JSW(20)                            TIDC 45
     2, RAIN(100),INTIME(100),INRAIN,JBOUND(20),JJBOUN                  TIDC 46
C                                                                       TIDC 47
C                                     TAPES                             TIDC 48
C                                                                       TIDC 49
      COMMON /TAPES/ INCNT,IOUTCT,JIN(10),JOUT(10),NSCRAT(5)            TIDC 50
C                                                                       TIDC 51
C                                                                       TIDC 52
C                                     TIDE COEFFICIENTS                 TIDC 53
C                                                                       TIDC 54
C                                                                       TIDC 55
C                                     TYPE DESIGNATION                  TIDC 56
C                                                                       TIDC 57
      INTEGER CPRT                                                      TIDC 58
      REAL LEN                                                          TIDC 59
C                                                                       TIDC 60
```

```
C                                       TIDAL CURVE FIT, 7 TERM          TIDC 61
C                                       SINUSOIDAL EQUATION              TIDC 62
C                                                                        TIDC 63
      WRITE (N6,140) KO,NI,MAXIT,NCHTID                                  TIDC 64
  140 FORMAT  (7HO KO IS,I3,19H NUMBER OF TERMS IS,I4,32H MAXIMUM NUMBERTIDC 65
     1 OF ITERATIONS IS,I4,21H TIDE CHECK SWITCH IS,I2)                  TIDC 66
C                                       IF KO EQUALS ONE, PROGRAM WILL   TIDC 67
C                                       READ FOUR POINTS OF INFORMATION  TIDC 68
C                                       AND EXPAND THEM FOR A FULL TIDE  TIDC 69
C                                                                        TIDC 70
C                                       NT IS THE NUMBER OF INFORMATION  TIDC 71
C                                       POINTS                           TIDC 72
C                                       MAXIT IS THE MAXIMUM NUMBER OF   TIDC 73
C                                       ITERATIONS                       TIDC 74
C                                       IF NCHTID EQUALS ONE, TIDAL      TIDC 75
C                                       INPUT-OUTPUT WILL BE PRINTED     TIDC 76
C                                                                        TIDC 77
C                                       DELTA IS THE ACCURACY            TIDC 78
C                                       LIMIT IN FEET                    TIDC 79
C                                                                        TIDC 80
      DELTA = 0.005                                                      TIDC 81
      NTT=7                                                              TIDC 82
      W = 2.*3.14159 /PERIOD                                             TIDC 83
      IF(KO.EQ.0) GO TO 225                                              TIDC 84
      TT(50) =TT(1)+PERIOD                                               TIDC 85
      YY(50)=YY(1)                                                       TIDC 86
      DO 220 I=1,4                                                       TIDC 87
      J=I+1                                                              TIDC 88
      IF (J.GT.4) J=50                                                   TIDC 89
      NI=NI+1                                                            TIDC 90
      TT(NI)=(3.*TT(I)+TT(J))/4.                                         TIDC 91
      YY(NI)=0.8535*YY(I)+0.1465*YY(J)                                   TIDC 92
      NI=NI+1                                                            TIDC 93
      TT(NI)=(TT(I)+TT(J))/2.                                            TIDC 94
      YY(NI)=(YY(I)+YY(J))/2.                                            TIDC 95
      NI=NI+1                                                            TIDC 96
      TT(NI)=(TT(I)+3.*TT(J))/4.                                         TIDC 97
      YY(NI)=0.1465*YY(I)+0.8535*YY(J)                                   TIDC 98
  220 CONTINUE                                                           TIDC 99
  225 CONTINUE                                                           TIDC100
      IF (NCHTID.NE.1) GO TO 240                                         TIDC101
      WRITE (N6,146)                                                     TIDC102
  146 FORMAT (29HO NO.       TIME         VALUE  )                       TIDC103
      WRITE (N6,148) (I,TT(I), YY(I), I=1,NI)                            TIDC104
  148 FORMAT (I4, 2F12.3 )                                               TIDC105
  240 CONTINUE                                                           TIDC106
      DO 280 J=1,NTT                                                     TIDC107
      DO 260 K=1,NTT                                                     TIDC108
  260 SXX(K,J) = 0.                                                      TIDC109
      AA(J) = 0.                                                         TIDC110
  280 SXY(J) = 0.                                                        TIDC111
      NJ2 = NTT/2 + 1                                                    TIDC112
      DO 360 I = 1,NI                                                    TIDC113
      DO 320 J = 1,NTT                                                   TIDC114
      FJ1 = FLOAT(J-1)                                                   TIDC115
      FJ3 = FLOAT ( J-NJ2 )                                              TIDC116
      IF ( J.LE.NJ2 ) GO TO 300                                          TIDC117
      XX(J) = COS(FJ3*W*TT(I))                                           TIDC118
      GO TO 320                                                          TIDC119
  300 XX(J) = SIN(FJ1*W*TT(I))                                           TIDC120
```

```
      IF( J.EQ.1 )XX(J) = 1.                                            TIDC121
  320 SXY(J) = SXY(J) +XX(J) *YY(I)                                     TIDC122
      DO 340 J = 1,NTT                                                  TIDC123
      DO 340 K = 1,NTT                                                  TIDC124
  340 SXX(K,J) = SXX(K,J) +XX(K) *XX(J)                                 TIDC125
  360 CONTINUE                                                          TIDC126
      IT = 0                                                            TIDC127
  380 IT = IT + 1                                                       TIDC128
      DELMAX = 0.                                                       TIDC129
      DO 420 K = 1,NTT                                                  TIDC130
      SUM = 0.                                                          TIDC131
      DO 400 J = 1,NTT                                                  TIDC132
      IF (J.EQ.K) GO TO 400                                             TIDC133
      SUM = SUM -AA(J)*SXX(K,J)                                         TIDC134
  400 CONTINUE                                                          TIDC135
      SUM = (SUM+SXY(K))/SXX(K,K)                                       TIDC136
      DEL = ABS(SUM-AA(K))                                              TIDC137
      IF (DEL.GT.DELMAX ) DELMAX = DEL                                  TIDC138
  420 AA(K) = SUM                                                       TIDC139
      IF ( IT.GE.MAXIT ) GO TO 440                                      TIDC140
      IF (DELMAX.GT.DELTA ) GO TO 380                                   TIDC141
      GO TO 460                                                         TIDC142
  440 WRITE(N6,150)                                                     TIDC143
  150 FORMAT (69HCANNOT REACH DESIRED DELTA, INCREASE EITHER NI OR DELTATIDC144
     1 AND TRY AGAIN)                                                   TIDC145
      STOP 6666                                                         TIDC146X
  460 CONTINUE                                                          TIDC147
      A1 = AA(1)                                                        TIDC148
      A2 = AA(2)                                                        TIDC149
      A3 = AA(3)                                                        TIDC150
      A4 = AA(4)                                                        TIDC151
      A5 = AA(5)                                                        TIDC152
      A6 = AA(6)                                                        TIDC153
      A7 = AA(7)                                                        TIDC154
      IF (NCHTIC.NE.1) GO TO 540                                        TIDC155
      WRITE (N6,152)                                                    TIDC156
  152 FORMAT (46H0      TIME    OBSERVED    COMPUTED      DIFF  )       TIDC157
      RES = 0.                                                          TIDC158
      DO 520 I = 1,NI                                                   TIDC159
      SUM = 0.                                                          TIDC160
      DO 500 J = 2,NTT                                                  TIDC161
      FJ1 = FLOAT ( J-1 )                                               TIDC162
      FJ3 = FLOAT ( J-NJ2 )                                             TIDC163
      IF ( J.LE.NJ2 ) GO TO 480                                         TIDC164
      SUM = SUM +AA(J) *COS(FJ3*W*TT(I))                                TIDC165
      GO TO 500                                                         TIDC166
  480 SUM = SUM +AA(J) *SIN(FJ1*W*TT(I))                                TIDC167
  500 CONTINUE                                                          TIDC168
      SUM = SUM +AA(1)                                                  TIDC169
      DIFF = SUM -YY(I)                                                 TIDC170
      RES = RES + ABS(DIFF)                                             TIDC171
  520 WRITE(N6,154) TT(I),YY(I),SUM,DIFF                                TIDC172
  154 FORMAT ( 4F12.4 )                                                 TIDC173
      WRITE (N6,156) RES                                                TIDC174
  156 FORMAT (6HOTOTAL , 30X, F12.4 )                                   TIDC175
  540 CONTINUE                                                          TIDC176
C                                                                       TIDC177
C                                     CONSTANTS FOR INPUT WAVE FORM     TIDC178
C                                                                       TIDC179
      WRITE(N6,158)JGW,A1,A2,A3,A4,A5,A6,A7,PERIOD                      TIDC180
```

```
158 FORMAT(///46H COEFFICIENTS FOR TIDAL INPUT WAVE AT JUNCTION16//85HTIDC181
   1      A1          A2          A3          A4          A5          A6        TIDC182
   2A7       PERIOD(HRS)///7F10.3,F12.2///31H WHERE THE WAVEFORM IS GIVETIDC183
   3N BY//92H H(J) = A1 + A2.SIN(WT) + A3.SIN(2WT) + A4.SIN(3WT) + A5.TIDC184
   4COS(WT) + A6.COS(2WT) + A7.COS(3WT))                                TIDC185
    RETURN                                                              TIDC186
    END                                                                 TIDC187
```

```
      SUBROUTINE TRIAN(II,JJ,KK,LL)                                     TRIA  1
C                                     SUBROUTINE TRIAN                  TRIA  2
C                                     HYDRODYNAMICS PROGRAM             TRIA  3
C                                     SPECIFICATION STATEMENTS          TRIA  4
C                                                                       TRIA  5
C                                                                       TRIA  6
C                                     CONTROL                           TRIA  7
C                                                                       TRIA  8
      COMMON /CCNTR/ N5,N6,N20,N21,  NTCYC,NQCYC,NHCYC,  NT,NQSWRT      TRIA  9
     1,  DELTC,DELT,TZERO,   ISWCH(10)                                  TRIA 10
C                                                                       TRIA 11
C                                     GENERAL                           TRIA 12
C                                                                       TRIA 13
      COMMON  ALPHA(30),  NJ,NC,   ICYC,KCYC,NCYC,   WIND,WDIR,EVAP     TRIA 14
     1,  PRECP(50),NEXIT                                                TRIA 15
C                                                                       TRIA 16
C                                     JUNCTIONS                         TRIA 17
C                                                                       TRIA 18
      COMMON  H(100),HN(100),HT(100),HBAR(100),HAVE(100)                TRIA 19
     1,  NCHAN(100,8),IPOINT(100,8),AS(100),VOL(100),X(100),Y(100)      TRIA 20
     2,  DEP(100),COF(100),CIN(100),QOU(100),QINST(100)                 TRIA 21
     3,  QINBAR(100),COUBAR(100)                                        TRIA 22
C                                                                       TRIA 23
C                                     CHANNELS                          TRIA 24
C                                                                       TRIA 25
      COMMON LEN(225),NJUNC(225,2),B(225),R(225),A(225),AT(225),AK(225) TRIA 26
     1,   Q(225),QBAR(225),QAVE(225), V(225),VT(225),VBAR(225)          TRIA 27
     2, FWIND(225),NUMCH(225),NTEMP(8)                                  TRIA 28
     3,NCLOS(225)                                                       TRIA 29
C                                                                       TRIA 30
C                                     PRINTOUT AND PLOTTING             TRIA 31
C                                                                       TRIA 32
      COMMON   NPRT,IPRT,   NHPRT,JPRT(50),PRTH(30,50)                  TRIA 33
     1,  NQPRT,CPRT(50),PRTV(30,50),PRTQ(30,50),  IDUM(12),ICOL(10)     TRIA 34
     2,  LTIME,  NPLT,NPDEL,JPLT(50),HPLT(50)                           TRIA 35
C                                                                       TRIA 36
C                                     STAGE-TIME COEFFICIENTS           TRIA 37
C                                                                       TRIA 38
      COMMON YY(50) ,TT(50) ,AA(10),XX(10),SXX(10,10),SXY(10)           TRIA 39
     1,A1,A2,A3,A4,A5,A6,A7,PERIOD,JGW                                  TRIA 40
C                                                                       TRIA 41
C                                     STORMWATER                        TRIA 42
C                                                                       TRIA 43
      COMMON  TITLE(30),NJSW,QE(20,2),JSW(20)                           TRIA 44
     2, RAIN(100),INTIME(100),INRAIN,JBOUND(20),JJBOUN                  TRIA 45
C                                                                       TRIA 46
C                                     TAPES                             TRIA 47
C                                                                       TRIA 48
      COMMON /TAPES/ INCNT,IOUTCT,JIN(10),JOUT(10),NSCRAT(5)            TRIA 49
C                                                                       TRIA 50
C                                                                       TRIA 51
      COMMON/TRI/T(5),NX(5)                                             TRIA 52
C                                                                       TRIA 53
C                                                                       TRIA 54
C                                     TYPE DESIGNATIONS                 TRIA 55
C                                                                       TRIA 56
      INTEGER CPRT                                                      TRIA 57
      REAL LEN                                                          TRIA 58
      IF(II.NE.0) GO TO 300                                             TRIA 59
C                                                                       TRIA 60
```

```
C                                          ZERO POINTER ARRAY
      DO 250 I=1,NJ
      DO 250J=1,8
      IPOINT(I,J)=0
      NCHAN(I,J)=0
  250 CONTINUE
      RETURN
C
C                                          SET UP TRIANGLE PARAMETERS
C
  300 CONTINUE
      NX(1)=II
      NX(2)=JJ
      NX(3)=KK
      NX(4)=II
      NX(5)=JJ
      T(1) = (X(JJ) - X(KK))**2 + (Y(JJ) - Y(KK))**2
      T(2) = (X(KK) - X(II))**2 + (Y(KK) - Y(II))**2
      T(3) = (X(II) - X(JJ))**2 + (Y(II) - Y(JJ))**2
      T(4)=T(1)
      T(5)=T(2)
C
C                                          DO ALL THREE SIDES
C
      NB=2
      IF(LL.EQ.0) NB=1
      DO 600 N=1,3,NB
C
C                                          LOCATE CHANNELS ON POINTER ARRAY
C
      I=MIN0(NX(N+1),NX(N+2))
      J=MAX0(NX(N+1),NX(N+2))
      DO 350 K=1,8
      IF(IPOINT(I,K).EQ.J) GO TO 370
      IF(IPOINT(I,K).EQ.0) GO TO 360
  350 CONTINUE
  360 IPOINT(I,K)=J
      NC=NC+1
      NCHAN(I,K)=NC
  370 M=NCHAN(I,K)
C
C                                          M IS CHANNEL NUMBER JUST
C                                          ASSIGNED
C
      NJUNC(M,1)=I
      NJUNC(M,2)=J
      SUB=T(N+1)+T(N+2)-T(N)
      G=SQRT(T(N))/2.
      LEN(M)=2.*G
      C=G/SQRT(4.*T(N+2)*T(N+1)-SUB**2)*SUB
      G=G/2.*C
      AS(I)=AS(I)+G
      AS(J)=AS(J)+G
      IF(C.LE.0.) WRITE(6,102) M,C
  102 FORMAT(' NEGATIVE WIDTH CHANNEL NO.',I5,'   WIDTH =',E12.4)
      B(M)=B(M)+C
      R(M)=(DEP(I)+DEP(J))/2.
      A(M)=B(M)*R(M)
      AK(M)=(COF(I)+COF(J))/2.
      V(M)=0.
```

```
600 CONTINUE                                                          TRIA121
    IF(LL.EQ.0) RETURN                                                TRIA122
    DO 750 NN=3,4                                                     TRIA123
    I=MINO(NX(NN),LL)                                                 TRIA124
    J=MAXO(NX(NN),LL)                                                 TRIA125
    DO 620 K=1,8                                                      TRIA126
    IF(IPOINT(I,K).EQ.J) GO TO 640                                    TRIA127
    IF(IPOINT(J,K).EQ.0) GO TO 630                                    TRIA128
620 CONTINUE                                                          TRIA129
630 IPOINT(I,K)=J                                                     TRIA130
    NC=NC+1                                                           TRIA131
    NCHAN(I,K)=NC                                                     TRIA132
640 M=NCHAN(I,K)                                                      TRIA133
    NJUNC(M,1)=I                                                      TRIA134
    NJUNC(M,2)=J                                                      TRIA135
    SUB=T(3)+T(4)-T(2)                                                TRIA136
    G=SQRT(T(2))/2.                                                   TRIA137
    LEN(M)=G                                                          TRIA138
    C=G/SQRT(4.*T(3)*T(4)-SUB**2)*SUB                                 TRIA139
    G=G/2.*C                                                          TRIA140
    AS(I)=AS(I)+G/2.                                                  TRIA141
    AS(J)=AS(J)+G/2.                                                  TRIA142
    IF(C.LE.0.) WRITE(6,102) M,C                                      TRIA143
    B(M)=B(M)+C                                                       TRIA144
    R(M)=(DEP(I)+DEP(J))/2.                                           TRIA145
    A(M)=B(M)*R(M)                                                    TRIA146
    AK(M)=(COF(I)+COF(J))/2.                                          TRIA147
    V(M)=0.                                                           TRIA148
750 CONTINUE                                                          TRIA149
    RETURN                                                            TRIA150
    END                                                               TRIA151
```

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27 Abstract:

A comprehensive mathematical model, capable of representing urban storm water runoff, has been developed to assist administrators and engineers in the planning, evaluation, and management of overflow abatement alternatives. Hydrographs and pollutographs (time varying quality concentrations or mass values) were generated for real storm events and systems from points of origin in real time sequence to points of disposal (including travel in receiving waters) with user options for intermediate storage and/or treatment facilities. Both combined and separate sewerage systems may be evaluated. Internal cost routines and receiving water quality output assisted in direct cost-benefit analysis of alternate programs of water quality enhancement. Demonstration and verification runs on selected catchments, varying in size from 180 to 5,400 acres, in four U.S. cities (approximately 20 storm events, total) were used to test and debug the model. The amount of pollutants released varied significantly with the real time occurrence, runoff intensity duration, pre-storm history, land use, and maintenance. Storage-treatment combinations offered best cost-effectiveness ratios. A user's manual and complete program listing were prepared.

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